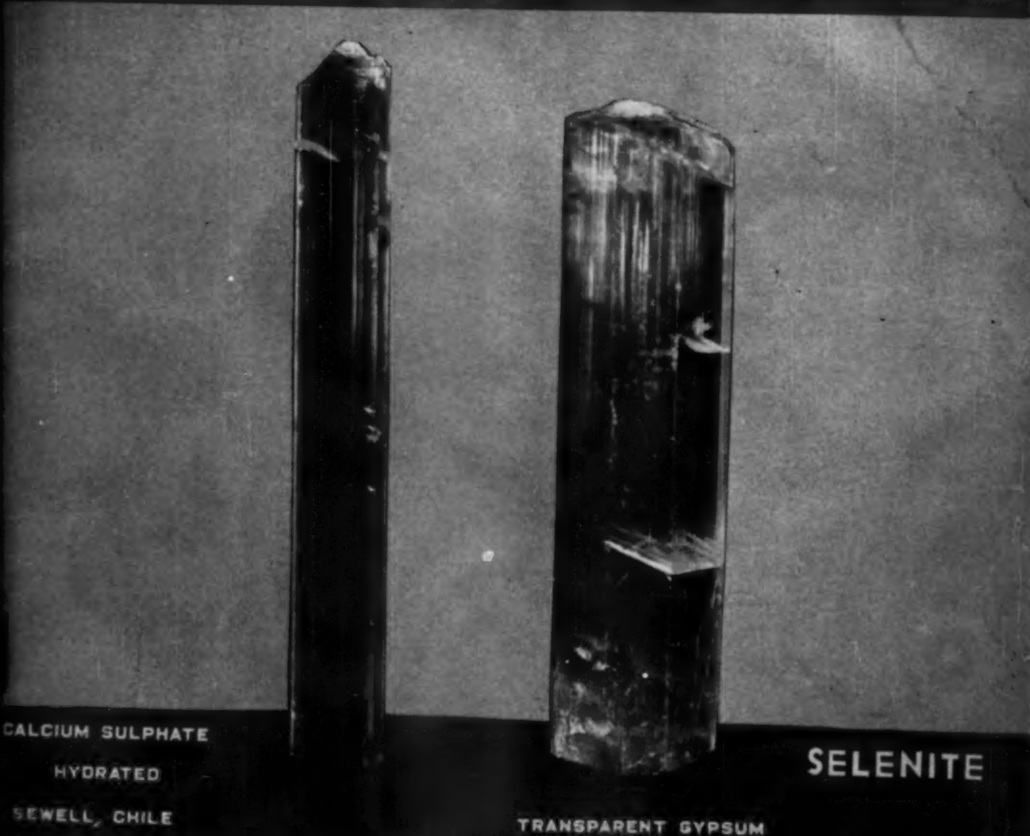
Earth Science

OCTOBER 1961

45c

Rockhounds' NATIONAL Magazine



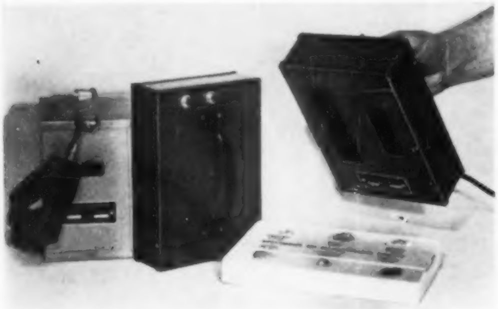
SELENITE CRYSTALS
Buckingham Hall of Minerals
Chicago Museum of Natural History

Tiger Eye Twin

LONG AND SHORT WAVE ULTRA-VIOLET UNIT

only
$29.75

Tiger Eye Twin model 25-36 shown with Battery Case model BA-245

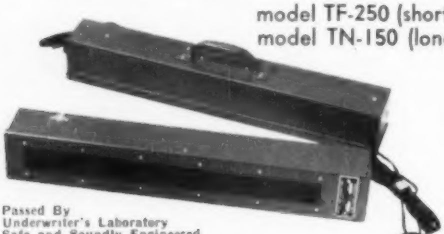


The TIGER EYE TWIN, when equipped with the Battery Adapter Case model BA-245 (optional—$5.75) and two 45 volt #202 "B" batteries (optional—$3.50 each) can be carried right into the field to give you on-the-spot information about the minerals you discover.

- Most powerful for the price . . . anywhere
- Based on the latest engineering principles
- Combines long and short wave in one unit
- Rugged all metal housing
- Extra large filters
- Comes set up, ready to use
- Easy access for replacing tubes
- Completely portable for field prospecting (with BA-245 case)
- Operates on house current or batteries
- Special circuitry for battery conservation
- Light weight . . . only 1 lb., 15 ozs.
- Compact . . . 5½"x2"x8½"
- Completely guaranteed

New TIGER EYE DISPLAY UNITS

model TF-250 (short-wave) **$58.95**
model TN-150 (long-wave) **$28.95**



Passed By Underwriter's Laboratory Safe and Soundly Engineered

- Output: Most powerful units for the price
- Extra large filters: 1½" x 16½"
- Angle-parabolic Alzac reflectors
- Handle removable for Display Mounting
- Isolated wiring compartment, SAFE for changing tubes. (Exceptional in this price range)
- Weight only 5 lbs. Size 3" x 3" x 20"
- Completely guaranteed

FREE BONUS!

All TIGER EYE Units come with fact-filled booklet "The Unseen World Around Us," including extensive lists of fluorescent minerals, woods, etc., PLUS Six Identified Specimens of long and short wave Fluorescent Minerals.

BLE

Manufactured and guaranteed by:

BLACK LIGHT EASTERN CORPORATION
Port Washington, L.I., N.Y.
Dept. ES-11

Contact your local dealer . . . or use this handy coupon today . . .

Black Light Eastern Corporation
4 Manhasset Avenue, Port Washington, L.I., N.Y. Dept. ES-11
Please rush!

........Tiger Eye Twin(s) #25-36	@ $29.75 ea.	....
........Battery Adapter(s) #BA-245 (with carrying strap)	@ 5.75 ea.	....
........45 volt #202 "B" batteries (2 required)	@ 3.50 ea.	....
........Tiger Eye #TF-250	@ 58.95 ea.	....
........Tiger Eye #TN-150	@ 28.95 ea.	....
	TOTAL $	....

Postage, insurance and handling
East of Mississippi .50—West of Mississippi $1.00
Enclose check or money order.

Name..
Address..
City.. State........ Zone........

Earth Science

Rockhound's NATIONAL Magazine

Official Publication of the Midwest Federation of Mineralogical Societies.

Volume 14
No. 5
$2.50 a Year

EARTH SCIENCE PRESENTS FOR OCTOBER, 1961

197 EDITOR'S MEMO PAD
Atomic blasts may produce gem stones, Rip Rap, and some good advice on "Who is Right" from our Sage of Mission, South Dakota.

201 NEW EXHIBITS SHOW RAPID PROGRESS IN MINERALOGY — Albert W. Forsley
Minerals in the new Buckingham Hall of Minerals are well arranged for educational study.

205 WIRE LACED JEWELRY — Doris Kemp
This method of making solderless jewelry is quite versatile and well worth trying.

208 EVERY ROCKHOUND CAN BE A SPACE SCIENTIST — Glenn I. Huss
Mineral collectors in the field should always be on the alert for new meteorites. They may thus contribute much to knowledge of the Universe.

210 MONTAGUE TRILOBITE COLLECTION PRESENTED TO THE MILWAUKEE PUBLIC MUSEUM
Mrs. Kathryn Montague contributes the splendid trilobite collection of her late husband, James O. Montague, to the cabinets of the Milwaukee Museum.

211 AMBER, NATURE'S GIFT FROM A FOREST — Frank L. Fleener
This is a subject of extraordinary interest to the student investigator. Don't miss reading it.

214 NOTES ON LUMINESCENCE
Excerpts from CIBA REVIEW, by courtesy of Ciba Limited, Basle, Switzerland.

217 BOOK REVIEWS

221 MIDWEST ANNUAL CONVENTION

225 MIDWEST CLUB NEWS

229 CALENDAR OF EVENTS

234 CLASSIFIED ADVERTISING

237 ADVERTISER'S INDEX

Cover — Selenite Crystals

Here pictured are choice specimens of Selenite Crystals, from Sewell, Chile, now displayed in the cabinets of the Buckingham Hall of Minerals, Chicago Natural History Museum. Photo, Courtesy of the Museum.

Published bi-monthly at Mount Morris, Ill., by The Earth Science Publishing Company, Inc. Advertising and Circulation Offices, Box 1357, Chicago, Illinois. Editorial Office, 406 Grover Street, Joliet, Illinois. Subscription: $2.50 per year, 3 years $6.00, United States and Canada. Elsewhere $3.00 and $7.50. Advertising rates sent upon request. EARTH SCIENCE is receptive to articles of Earth Science interest. Manuscripts, photographs, sketches will not be returned unless accompanied by ample first-class postage. Permission to quote or reprint articles from this magazine will be considered upon written request. Communications for editorial consideration should be sent to Ben Hur Wilson, 406 Grover St., Joliet, Illinois. The Earth Science Publishing Company makes every effort to select its articles and advertising carefully in order to merit the confidence of our readers, but assumes no responsibility for the statements and opinions expressed by contributors and/or advertisers in the magazine.

Formerly
Earth Science Digest

CHANGE OF ADDRESS
Subscribers should notify their Postmaster, and the Earth Science Subscription Department at least thirty days before change is to take place. Both old and new address should be given to assure promptness and accuracy. Postmaster: Send Form 3579 to P.O. Box 1357, Chicago, Illinois.

Published Bi-monthly: February, April, June, August, October, December

Second Class Postage Paid at Mt. Morris, Illinois

Editor's Memo Pad

Atomic Blast Rubies

Those who were fortunate enough to visit one of the many excellent faceted gem displays exhibited at the Saginaw Midwest Convention in June, had the privilege of seeing one of the rarest of all man-made gems—the result of an underground atomic blast which was detonated in 1957, the site of which was recently entered and explored for the first time.

These man-made diamonds and rubies were found lining the walls of a huge ballroom-like cavern created as the result of the experimental atomic explosion in a tunnel alcove some 400 feet below the top of a mountain near Mercury, Nevada.

"They are technically diamonds, although we'd have a hard time selling them," says an AEC scientist. "We predicted things like diamonds and rubies would be formed, and they were. Their hardness is around seven to eight, against ten for genuine diamonds, but they really are chemically impure, radio-active teardrops as large as the Hope diamond, which have been plucked from the walls, glistening most beautifully in the light of the electric bulb."

The nicely faceted atomic gem-stone exhibited at Saginaw was highly transparent, scintillating a radiant golden color. Those who saw it will not soon forget the startling impression made upon their mind when they first realized the true origin of what they were looking at.

Never Overlook a Bet

In our August issue an excellent article was published, "Sight Identification of Glacial Pebbles," by Wm. J. Bingham, to which we would like to add a wee bit of advice — perhaps only Rockhound puppy philosophy—and that is, never overlook a bet when collecting anything in the field.

Even diamonds, some of considerable value, have been found in the glacial drift of many of our Midwest states, as many as thirteen having been recovered in the state of Wisconsin alone. In case of doubt call on the advice of an expert, but in the meantime some simple tests may be made which may aid in answering your questioning.

It is true that most gems of value have simple telltale properties which one may easily post himself upon by carefully studying available literature, and which may be easily observed by simple tests and observations. For instance most all gems of value have a greater hardness than quartz (seven) and so our first advice would be for one always to carry a quartz crystal with smooth face in his pocket, and whenever you pick up a pebble (or fragment) which looks suspicious, make a scratch test on the face of the crystal. If a visible scratch is made which you can feel with your finger nail, by all means do not discard your find until you have further investigated.

Only recently it has been reported that Kermit Martin, a gem hunter in North Carolina, has found what might possibly be the world's largest pink sapphire, and also the nation's largest ruby, as well. These were found in the Cowee Valley gem fields of the mountains of western North Carolina. The rough-stone ruby, which contains some flaws, weighed 3,421 carats, while the sapphire weighed approximately 14 ounces, being 3 by 5 inches across by ¾ of an inch thick. It is of excellent quality and when cut should produce at least a 2,000 carat gemstone.

We shall await more information upon these finds with interest, and should the reports prove correct they will provide a sensation unequalled in the history of American gem hunting. In the meantime, remember, "never overlook a bet" when you are out collecting in the field.

Rip Rap

Up to 50% of **exploration costs** for scarce minerals will be borne by the U.S. Department of the Interior. Gold, silver, iron ore, bismuth, sulphur, and tellurium have recently been added to the list. Apropos is No. 3, Vol. 4 of the Colorado School of Mines Mineral Industries Bulletin "Guide to Colorado Gold Deposits."

The American Association for the Advancement of Science has concluded that kindergarten may not be too early for exposure to **science education.** Young children are naturally curious about the universe and are continually exploring their immediate environment, the Association's June 1961 report stated. They are capable of understanding classification, order, function, and other basic ideas used in science.

Hardly a mail arrives at Earth Science without this familiar request in one of its many variations: "Please send me your magazine. I am 9 years old and want to learn all about rocks." On July 23rd last Susan Taylor of Pacific Grove, California decided a bare request to receive Earth Science was inadequate. She established her status as a serious collector by drawing lines across her stationery and carefully printing the names of the thirty-one specimens in her collection.

Mineralogy in a best seller. Irving Stone's Michelangelo (The Agony and the Ecstasy) sees the block of marble for his Piéta thus: "There it stood . . . beautifully cut by the quarrymen high in the mountains of Carrara. It tested out perfect against the hammer, against water, its crystals soft and compacted with fine graining. He . . . watched the rays of the rising sun strike the block and make it as transparent as pink alabaster, with not a hole or hollow or crack or knot to be seen in all its massive white weight."

Have you observed **Worms in your agates?** Gems and Gemology reports a complaint from a client about wormlike markings (inclusions?) in an agate tablet which he said had spread in recent years and pushed the top bands closer together. Even a sharp-eyed cat can be fooled by nature. At least Walter Burdette of Nyssa, Oregon writes that his approached the image of a fish in one of his geode halves with gustatory anticipation.

Our Authors

Glenn I. Huss is the Director of the American Meteorite Laboratory of Denver, Colorado, a research organization designed to contribute such vital information as may be obtained through the study and analysis of meteorites, concerning the true nature of what man may expect to encounter in space travel.

He tells us that Rockhounds should not overlook any opportunity they may have to contribute to this effort through the finding of new specimens of these so-called "Messengers from Heaven," while they are out on mineral collecting trips in the field.

Interested in Paleontology?

For all Rockhounds who are in any way interested in the collection or study of fossils, we gladly publish the following general invitation for you to become a member of the Paleontological Society, a nation-wide organization, publishers of the well known "Journal of Paleontology."

"The President and the Council join me in extending to you an invitation to become a member of the Paleontological Society.

"The Paleontological Society is the foremost society exclusively for paleontologists in this hemisphere. It is not an exclusive society, however. The sole requirement for membership is A SINCERE INTEREST IN PALEONTOLOGY. Membership ($10 per year) brings all six numbers of the *Journal of Paleontology*, voting privilege, announcement of meetings, and notices of GSA publications, as well as an income tax deduction.

"If there are no local members of the Paleontological Society, the officers and I will be glad to sponsor you for membership."

Sincerely,
F. D. Holland, Jr.,
Chairman Membership Committee
University of North Dakota
Department of Geology
Grand Forks, North Dakota

WHO IS RIGHT?

June Culp Zeitner

"EVERYONE says a good collection should be accurately labelled, but how is one to know who is right? I have a barite rose which a friend bought for me in South Dakota. A book listed this as being a South Dakota form of barite, and the Dakota dealer did not deny it. A local (Indiana) museum lists such a specimen as being from Dakota. However a dealer from Michigan, and a dealer from Wisconsin, informed me my specimen is from Oklahoma! Mrs. Zeitner, what is a rockhound to believe?"

The above excerpt is from a recent letter I received from a collector in Indiana. It is not the first letter of this type I have received, and I know that editors and professors must often hear similar questions.

In a large museum I saw a cluster of sand calcite crystals labelled from North Dakota, yet the only place the true sand calcite crystals are found is in southern South Dakota. A dealer in the east once tried to sell me purple fluorite for amethyst. And to go back to the letter the rose pictured in the book was indeed from Oklahoma.

Shall we blame the dealers, the books, or the museums, for this situation? Actually all are to blame to some extent, but to a large degree we must also blame rockhounds. Museums and dealers get their material from rockhounds. Writers get their information from museums and dealers. If rockhounds do not keep and give accurate information everyone suffers.

But spreading the blame does not correct the situation. There are several things every rockhound can do to help keep this rapidly growing hobby at a high scientific level.

1. Keep a field record of every specimen you actually find yourself. This should be a detailed description of both the location and formation. Don't just guess at the name of a rock; if there is any doubt, have it identified or analyzed by someone competent to do so.

2. Although reading is still the best way to learn of places you can not visit, remember authors too are unable to visit every spot and know every rock. If there is disagreement between books try to get your questions answered by a well-known collector in an area near to where the rock in question was found.

3. Insist on getting the location of every specimen you trade for, or buy. Dealers will be glad to help you get proper information on many items. However, dealers too are often given misinformation. A dealer who specializes in a certain type of material, especially local material, is a good source. Unfortunately in some busy tourist areas some dealers handle rocks only for profit and are perfectly willing to sell slag glass or goldstone for real gems. It is the beginning rockhound who must be alert for such items. Older rockhounds soon spot imitations and dyed stones.

4. If you have a stone about which there is a question, either type or locality, a local club may solve it for you. An unusual specimen may arouse some club discussion, but the ones to believe are the ones who say, "I've been there," not the ones who say "*They* tell me that—." In fact a good idea for a club program would be for everyone to bring a stone about which the identification was hazy.

5. If a rockhound spots a mistake in a publication, museum, or shop, offer the correction in a nice manner. After all our field is so big that no one should feel embarrassed at not knowing it all.

6. Read your mineral magazines and keep the old copies for reference. Most of these magazines carry accurate information about new finds and new locations as well as histories of old locations. Most of the articles are written by specialists in certain branches of this large hobby or certain areas of discovery.

7. Most states have a state geologist and a state School of Mines. Usually the professional men in this field are glad to help identify rocks or pinpoint locations. Again these men are probably more familiar with local materials than unusual items from far away. They would be able to tell you if a crystal was apatite or beryl but unless it had some famous characteristic they might not be able to give you the exact location.

8. Don't be too discouraged if once in a while you hear or see a wrong identification. Considering the scope of the rock and mineral hobby and the number of new recruits who enter it every year, we have a surprising record of scientific accuracy, and we hope it will be yet further improved as time goes on. Please exert your efforts in this direction.

Earth Science

Rockhounds' National Magazine

Vol. 14
No. 5

October, 1961

New Exhibits Show Rapid Progress in Mineralogy

By ALBERT W. FORSLEY

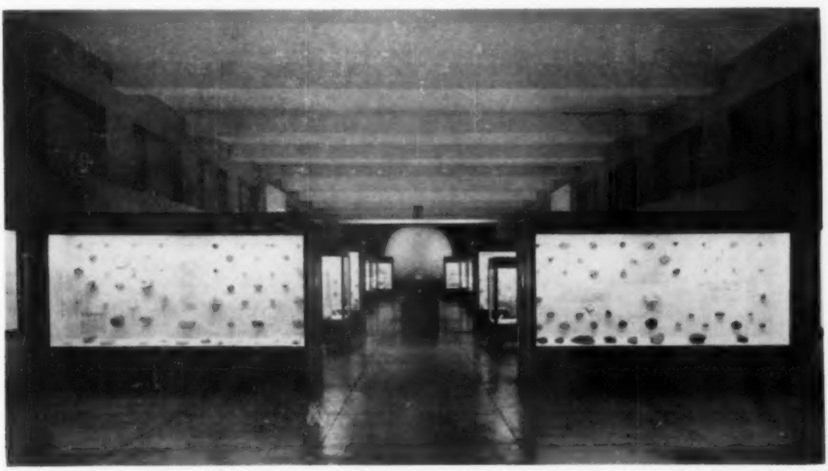
The New Hall of Minerals

Scope of Exhibits

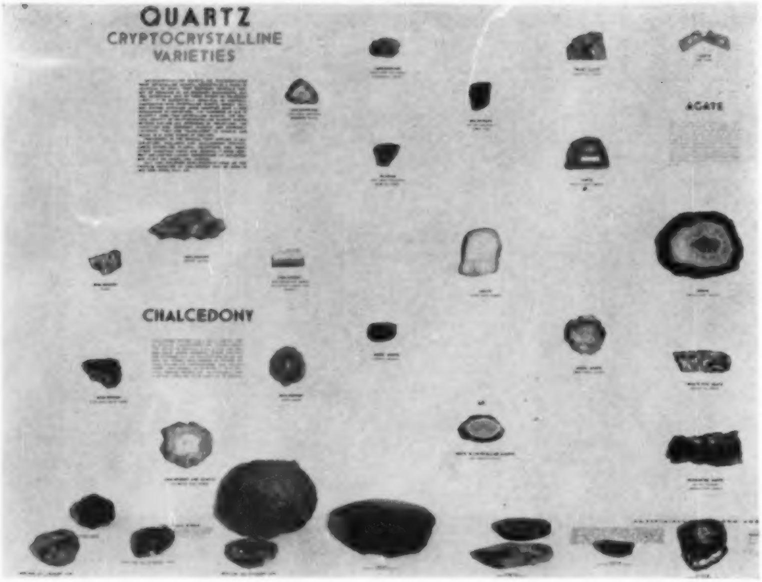
IN THE NEW HALL of Minerals, hundreds of specimens, models and illustrations are used to depict the present day ideas on the physical-chemical composition, formation and classification of minerals. The mineral specimens displayed include common and rare species collected from many parts of the world.

The arrangement of the hall follows, in general, a general classification based on the seventh edition of Dana's System of Mineralogy. Minerals of simple chemical composition such as native elements and sulfides are exhibited near the east end of the hall, and the complex silicate minerals at the west end. Within the individual exhibits, the minerals are arranged according to their chemical formula and crystal structure. Models and diagrams are used in conjunction with crystals of various minerals to illustrate the manner in which the external crystal reflects the atomic structure.

The Chalmers Crystal Collection, housed in four special exhibition cases, is used to illustrate the classification of minerals and crystal forms, the difference between minerals and rocks, and the physical properties of minerals, such as hardness, color, streak, cleavage and luster.



Clarence Buckingham Hall of Minerals looking East to West. Chicago Natural History Museum



Special Exhibit of Quartz Family Minerals

Noteworthy Specimens

Throughout the hall many impressive specimens are to be seen. Some are exhibited in specially built niches because of their large size. Among them are a 312-pound block of lapis lazuli recovered from an Inca grave in Peru, two exceptionally large selenite crystals, and a spectacular wulfenite cluster showing a delicate network of golden crystals.

Several exhibits are devoted to uncommon features of minerals such as twin crystals, where two or more individuals have symmetrically intergrown; and phantom crystals, where because of interruptions during growth of the crystal, outlines of its crystal form are preserved in its interior. Another exhibit is devoted entirely to pseudomorphs: minerals that have taken the crystal form of another through substitution or alteration. The Hall of Minerals will present to the visitor an interesting introduction to the members of the Mineral Kingdom and the concepts of the mineralogist living almost 2300 years after Aristotle.

History of Classification

Although extensive physical evidence exists regarding early man's use of rocks and minerals in the fashioning of tools and weapons, we know but little about his views on their origin and composition. One of the first written records we have is by Aristotle (384-322 B.C.) in his Meteorologica in which he briefly commented on the subject. He proposed that the minerals were formed in the earth under the influence of rays given off by the sun and other heavenly bodies. The rays were believed to give rise to certain types of vapors which reacted with the elements to form stones of various kinds. According to him there were four basic elements: fire, earth, air and water. The properties of minerals were determined by the relative proportion of each of these elements present. Metals were believed to consist mainly of the elements earth and water, perhaps because they became fluid when heated and were malleable when hammered. "Fossils" such as sulfur and realgar were believed to be composed chiefly

Special Exhibit of Silicified Wood

of the elements fire and earth. The term "fossil," derived from the Latin word fossilis, meaning a thing dug up from the earth, was used in literature as late as the 19th century to apply to minerals, rocks and fossils, and no distinction was made between the three classes until the individual sciences of mineralogy, petrology, and paleontology came into being.

From Aristotle's time up until about the 16th century, little original work was done in the field of mineralogy. The medieval writers who largely drew their ideas from Pliny's Natural History (A.D. 77) and the writings of Theophrastus (370-287 B.C.) were concerned primarily with the medicinal and mystic properties of minerals; and the scientists of the same period, it seems, were interested only in controlling these magical powers. Aristotle's explanation of the origin of minerals was universally accepted for almost 2000 years, finally replaced by two other theories which successively came into prominence. The first of these likened the mineral kingdom to the plant and animal kingdoms and even assumed that the two sexes were involved in the formation of minerals. The assumption was based on the idea that minerals had a life cycle and that they originated from a seed, grew to maturity and frequently decomposed or altered: the equivalent of disease in the animal and vegetable kingdoms. This postulation, popular during the 16th and 17th centuries, gradually gave way to the "Theory of Lapidifying Juice", which in many respects was the fore-runner of modern theories and represented a distinct advance toward a true solution. According to this concept, a universal fluid circulated throughout the earth depositing mineral matter in pores, cracks, and other openings in the rock and soil composing the earth.

The advent of extensive mining activity in central Europe during the 15th and 16th century generated widespread interest in minerals. The development of mining in the Schneeberg district of Saxony in 1420, at Annaberg in Saxony in 1495, and at Andreasburg in the Hartz around 1570, brought natural scientists into greater contact with minerals than ever before. They began to pay more attention to the physical properties of minerals and in so doing laid the basis for today's systems of classification. The most important contributor to mineralogy during this period was Georgius Agricola (1494-1555) who, as the city physician of the great mining towns of Joachimstahl in Bohemia, and Chemnitz in Hungary, spent most of his life in close association with miners, mines and minerals. He was one of the first naturalists who relied on personal observation and research in the study of minerals and is rightfully called "The Father of Mineralogy". His De Natura Fossilium, published in 1546, is considered to be the first textbook on mineralogy. In it he described many new minerals and presented a classification based on physical properties such as specific gravity, color, hardness and luster.

From this time on, there was a rapid development of mineralogy as a science, and with the advent of chemistry in the 18th century new systems of classification utilizing the chemical composition of minerals were introduced. One of the most important contributors to the field during this period was Abraham Werner (1750-1817), whose system of classification using both physical and chemical properties of minerals was in use throughout Europe at that time. Almost concurrently, the Swedish chemist, Jons Berzelius (1779-1848), determined the molecular weights of some 2,000 compounds and developed for the first time a chemical classification of minerals. Another contributor of equal importance, and a contemporary of Werner, was René-Just Hauy (1743-1821), a French botanist-mineralogist, who helped found the science of crystallography. He developed the basic ideas relating the crystal form and cleavage of a mineral to its molecular structure.

Reclassification Established

One of the most famous mineralogists of the 19th century was James Dwight Dana, who removed much of the confusion that existed, and clarified the classification of minerals. His System of Mineralogy, first published in 1837, is a classic and contains a wealth of information of acknowledged excellence. Although the first two editions (1837 and 1844) used a Latin nomenclature along the lines of botany and zoology and a classification based on the external features of minerals, he completely rejected this approach in his later editions 1850, 1854, and 1868) and followed a chemical classification. The work was continued by his son Edward S. Dana, with a sixth edition in 1892.

With the discovery of X-rays by Roentgen in 1895 and work by E. Von Laue and Sir Wm. Bragg in 1912 on the diffraction of X-rays by crystals, a new era in mineralogy began. For the first time it became possible to determine the arrangement of atoms within a substance. The relationship between chemical composition, atomic structure and external crystalline form has been determined for many minerals and continues to be a major field of research in mineralogy. The information obtained so far has been used to set up a modern system of classification based on the properties and has resulted in the publication of the seventh edition of Dana's System of Mineralogy. This new work in three volumes contains detailed information and data for almost 2,000 minerals. The first two volumes have been published and the third, dealing with the silicates, is in preparation. Finis.

N. B. This informative article appeared originally in the Chicago Natural History Museum Bulletin, and is reprinted with permission.

The pictures accompanying this article also are reproduced with the permission of the Chicago Natural History Museum.

We highly recommend that visitors to the Chicago area take advantage of the chance to see one of the finest mineral exhibits in the country, now displayed in Clarence Buckingham Hall.

Wire Laced Jewelry

By DORIS E. KEMP

This method of making solderless jewelry is very versatile and can be used in making pendants, earrings, bracelets and other items. Only the usual tools necessary for silver work are needed, plus a hand drill with some very small gauge drill bits. This being a solderless method, NO soldering torch is used.

The interesting part of making this jewelry is that any shape of stone can be used; polished small slabs are extremely well utilized. There is no limit to design when using this method. The design of the piece to be made is to be worked up by you and this is easy. Just take a stone, lay it on a piece of paper, and with a pencil draw an outline around it. Now begin to sketch how you would like to have the stone framed by a lovely piece of sterling silver. Keep trying with different sketches, till you have one that seems to please your eye.

Let us for this time, decide to make a pendant. We will need a nicely polished stone, one the shape of a teardrop is what we will use in this pendant. After sketching a design for this stone we have come up with an idea that will look like *Fig. 1.* Now that we have the design, we will need a pattern to use in the process of sawing. The pattern is to be cut from a piece of white paper and will look like *Fig. 2.* The lines of this design are smooth and flowing and now we need to add the plans of where we are to lace the wire in and out of drilled holes in the silver. We have decided to space the holes as you see in *Fig 3.* This is how we would like to see the wire laced back and forth in front and back of the stone. Our design is now complete.

With a pattern cut from paper like Fig 2, using rubber cement, glue it on a piece of 20 gauge sterling silver sheet stock. Using a jewelers saw, slowly saw around the pattern. Next, with a hand drill and a drill bit the thickness of 18 gauge round wire, we will drill the holes needed for the lacing, including the hole at the tip of the space where the stone will fit. This hole is necessary to start the sawing to remove the silver where the stone will be set. With a "C" clamp, fasten the silver piece to a V wood vise and then with an awl and a small hammer, make an indentation where you will drill. This tiny indentation will keep the drill from sliding as you start to drill. In this design, drill the 9 holes.

WIRE LACED JEWELRY

WIRE LACED PENDANT

In order to saw the center out, which is actually called piercing, detach one end of the saw blade from the jewelers saw. Slip the blade end through the hole in the silver, again attach the blade to the saw and proceed to slowly saw the center out. Be very careful to stay on the penciled line of the pattern, as we want a neat close fit, with the stone being able to just fit in the space, when the silver is removed.

After the sawing (leave pattern on the silver), with needle files file the edges, including the center hole edge, so no saw marks show. It must be pointed out now that the fit of the stone in the center space is important. After you have filed the edge smooth, fit the stone in the hole just so it will slip through in its right position. When you hold the silver piece with stone in place, up to a ray from an electric bulb, it is best to be able to just see an even streak of light, about a millimeter in size at the most, come through all the way around the stone. *See Fig 4.*

Next, remove the paper pattern, then with very fine steel wool, rub briskly in one direction. The silver will work into a very fine satin finish. Work this way until no scratches are visible. Wash the silver very well with a mild soap and soft brush, then use a muslin

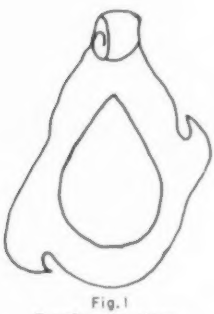


Fig. 1
Framing the stone

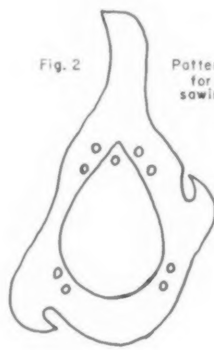


Fig. 2

Pattern for sawing

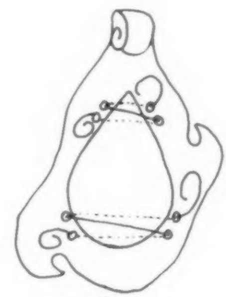


Fig. 3
Wire lacing plan

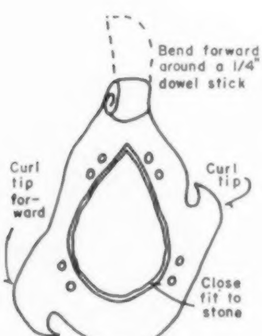


Fig. 4

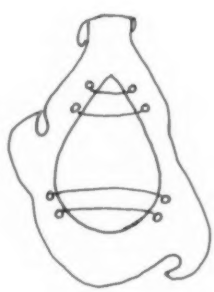


Fig. 5
Back view

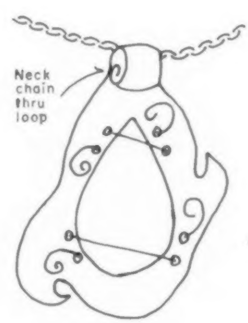


Fig. 6
Front view—Finished pendant

Steps in Making a Piece of Wire Laced Jewelry

Materials needed: $3 \times 1\frac{1}{2}$ inch — 20 or 22 gauge sterling silver sheet. 8 inches — 18 or 20 gauge round sterling silver wire. One polished gem cabochon.

buff and tripoli to work the silver to a finer finish. Wash the silver again and use another muslin buff with jewelers rouge and you have achieved a beautiful mirror finish.

Now we come to the bending of the top. *See Fig. 4.* This is bent around a wooden dowel stick that is about 1/4" in diameter. Using the wood stick will eliminate scratching our nicely polished silver. This loop we will now form with the piece of extended silver is the neckchain loop. No jumpring or other fastener will be necessary as the chain passing through this silver loop will let the pendant hang flat and straight. A few additional bends could be made; these are the upsweep and downsweep hook curves on both sides. Bending these forward over a dowel stick gives our piece depth, it loses the "flat" look.

We are down to the final step and here is where the lacing starts. Using 18 ga. round silver wire, cut two 4" lengths. The lengths will vary, depending upon the size stone you are using. This you must judge and it is always better to have it too long as you can always snip off a bit. Looking at the pendant, right side up, start lacing by threading the wire through the top hole on the right hand side. Leave about 1/2" extended on the top side of the pendant, with your finger, bend the wire on the underneath side, flat against the stone (holding the stone in place with fingers of the left hand). Thread the end of the wire through the top hole from the underneath side, on the left side of the pendant. With your fingers, pull the wire up through on the top side, so the wire is snug against the stone underneath (still holding the stone in place with your left hand fingers). Then bend the wire flat across the top of the stone on a slight angle toward the second hole on the right side of the pendant. Thread the wire down through the hole on the right side, bend the wire across the stone on the underneath side, keeping the wire running parallel with the first wire we bent against the stone. Thread the wire up through the second hole in the left side and now we have two ends extending on the top side of the pendant. These ends could be flattened by tapping with a small hammer on a metal table, anvil or vise. Using a chain nose pliers, now curl the ends in a fashion that becomes the pendant. *See Fig. 6.*

The next set of holes and the last piece of wire we have are to be handled in the same way as described above. The important thing to remember is to bend the wire with your finger tips (this avoids scratching the wire) and bending close to the hole so the wire is flat and snug against and across the stone so when we are finished the stone does not move in any way.

You will notice the back of the pendant has four lines of wire across the stone and in front only two are across the stone. *See Fig. 5.* If you desire to cut a stone specifically to set in this method, it is a clever idea to use any banding or pattern that may be present in the design of the stone, cutting the banding on an angle to correspond with the angle of the wire. This adds attractiveness to the stone. Also, the lacing can be started from the underside and you will find that you have two lines on top of the stone and one wire line underneath. This can be used as part of your design if you are using a plain or clear stone.

This is only one of hundreds or who knows how many ways we can use this wire lacing method. If we make earrings, to make them lighter in weight use thinner gauge silver sheet and smaller gauge wire. Several clever tie bars have been made for the men. I have also made an attractive bracelet using gold plated sheet, gold wire and a pointed oval cabochon of olive green jade. On this piece I did not cut the center hole as that made it a bit stronger and looks just as attractive. Cutting the center hole is a wonderful way to use double sided cabochons, also the many transparent stones. A good example would be to use iris agate. The light coming through the stone will show the iris colors. The effect is unusual and pleasing.

(*Concluded on page* 224)

Every Rockhound Can Be A Space Scientist

By GLENN I. HUSS

MOST rockhounds are doubtless aware of the continuing need among American scientists for more research material in the form of meteorites. And most rockhounds would be more than willing to assist in any program to obtain more meteorites for research if only more information on the subject were made available.

Meteorites have locked within them many of the secrets of the composition, history, and origin of the solar system and the universe. They also have much to tell us of the conditions to be expected in travel outside of our protecting atmospheric blanket. However, in the past meteorites were generally overlooked as possible sources of knowledge for the benefit of mankind.

The current shortage of meteorites in American laboratories today is directly attributable to an amazing lack of interest in the subject of meteoritics throughout our culture. Until recently, educators were not interested in meteoritics; and the geological profession gave meteorites so little attention that today the average geologist is not equipped to positively identify a meteorite. Our universities and colleges as a whole had little interest in these "curiosities" from space and it was only through the initiative of individual professors and the largess of wealthy donors that meteorites were allowed to gather dust in university collections. Even the officers of our great national repository, the Smithsonian Institution, de-emphasized the collection of meteorites from the early 1930's onward.

Three stony meteorites from the Richardton, North Dakota fall of June 30, 1918. The stone on the lower right fell into a stubble field of wheat and uncharred straw fibers still cling to it. The checkered appearance of the specimens results from contraction of the crust during cooling.
Courtesy American Meteorite Laboratory.

In fact, in all of the history of the United States, or of the world for that matter, only one person, Dr. H. H. Nininger, has had the foresight, interest, and determination to make a full-time job of collecting and studying meteorites. His efforts since 1923 have resulted in the discovery of more than 223 of the 1,600 meteorite falls known to man.

The system which proved so successful for Dr. Nininger is as applicable today as it was in 1923 when he advised it: Provide free education in the recognition of meteorites, make identifications of suspected meteorites free of charge, and stimulate interest in the search for meteorites by purchasing at fair prices all meteorites thus discovered which the owners wish to sell.

But, what is a meteorite? Technically, a meteorite is a mass of solid mineral substance too small to be considered a minor planet, traveling in space, passing through the atmosphere, or having landed on the earth and still retaining its identity. The light phenomenon which a meteorite generates as it passes through the atmosphere is called a *meteor*.

Current knowledge indicates that meteorites probably originated in the disruption of a planet similar to, but smaller than, our own which existed in our own solar system some hundreds of millions of years ago. The debris of this planet traveling on eccentric orbits around the sun has been colliding with the earth and other planets since the planet broke up.

Meteorites are composed of the same elements which we find on the earth, which makes them somewhat less exotic than our imagination and some writers would have us believe. The fact that over 90 per cent of all meteorites to come to earth are composed of silicate minerals, as are most of the surface stones of the earth, makes them even more prosaic and much more difficult to recognize. They do have distinguishing characteristics which can be recognized, or at least strongly suspected, by anyone who has been made aware of them.

The freshly fallen meteorite is usually covered with a black, somewhat shiny coating which has resulted from the surface material of the meteorite having been melted as it passed through the atmosphere on its way to earth.

As it lies in the soil, the meteorite becomes brown from the rusting of the metal which is contained in its outer portions. Most meteorites to be found fit this description.

Meteorites are usually irregular in form having almost any shape and being more or less pitted with the corners and edges notably dulled or rounded. (Occasionally, an iron meteorite will have sharp corners and ridges created on its surface by exfoliation as it lies in the soil.) A few meteorites have been found which are conical in shape, but there has never been a meteorite found which was round like a ball. This is because only the surface of a meteorite is melted during its aerial flight and it does not become a plastic blob to take on a round or tear-drop shape.

Meteorites are not light, porous rocks, but are usually much heavier than ordinary rocks. This is largely because they nearly always contain an alloy of nickel-iron. This metal may be in small grains embedded in a stony matrix (most meteorites are of this type), or it may make up the entire meteorite. In either case, grinding the corner of a suspect with an emery wheel or emery paper will reveal bright white metal.

Whenever any or all of the above earmarks are found in a stone, it does not definitely prove that the stone is a meteorite; but it does indicate a better than 50-50 chance that such is the case, and the stone should be checked by an expert.

The American Meteorite Laboratory, P. O. Box 2098, Denver 1, Colorado, makes tests on suspected meteorites free of charge, requesting only that postage be sent for return of the sample should the sender wish it back regardless of whether it is or is not meteoritic.

(Concluded on page 213)

Montague Trilobite Collection Presented to Milwaukee Public Museum

One of the country's finest trilobite collections has recently been presented to and placed in the cabinets of the Milwaukee Public Museum as a gift of Mrs. Kathryn Montague, wife of the late James O. Montague, Honorary Curator of Geology of the Museum, in memory of the life and work of her husband.

"Jim", as he was affectionately known by his hundreds of friends throughout the entire country, was one of the founders of the Midwest Federation, and served as its third President. He was also the General Chairman of the Midwest-American Convention held in Milwaukee in 1954, and all who attended this fine show will well remember the remarkable finesse of all plans and arrangements made and carried out so successfully under his skillful management.

Montague, long an ardent collector of minerals, traveled widely in his search for the very best obtainable, and in his own personal collection were found many superb specimens which might grace the cabinets of any museum. Many Rockhounds, sooner or later while collecting, pick up a fossil or two which arouses their curiosity sufficiently, that the paleontological bug bites them, and they are off on a new field of adventure. In this "Jim" was no exception, only in his case he went all out for the subject, and Trilobita became his hobby.

(*Concluded on page* 225)

Mrs. James O. Montague explains a fossil from the collection of her late husband, recently presented to the Milwaukee Public Museum, to Linda Chapman, student assistant, and Lee Techear, Curator of Geology of the Museum. Photo courtesy Milwaukee Sentinel.

AMBER—Nature's Gift From A Forest

by FRANK L. FLEENER

IN Lillian Mihelcic's recent article on "Amber Lore", we find this poignant statement, "Amber may be only a fossil from wood, but it has been a prime favorite with the peoples of all ages, extending well backward into the vast eons of time". Archaeological investigations in both Europe and western Asia bear out the validity of this sweeping statement.

There seems to have been considerable confusion in the minds of ancient scholars as to the true nature of this alluring substance. Some of the Greek savants said that it might be condensed sea foam, others thought that it was impurities of the sea water condensed by freezing. However, Pliny, the great Roman encyclopedist, preferred to call it "succinum", which means "sap stone", because it was plain to him that it was the hardened gum of some sort of tree. The Greek name for amber was electron, which recalls the first recorded electrical experiment, that of Thales (640-546 B.C.), who noticed that when a piece of amber was rubbed, bits of shavings and other light materials were attracted to it. From this Greek word for the substance, our word electricity with all its implications has come.

While the true nature of amber was puzzling to the ancients, there is no doubt upon the subject in our minds today. Amber is now known to be the fossil resin of an ancient, extinct species of pine known to our scientists as Pinus succinifer, which flourished during the Lower Oligocene time, some ten million years ago, especially in the region now occupied by the Baltic Sea.

No one has ever seen a living Pinus succinifer, for our knowledge of its physical characteristics is dependent upon bits of the wood, leaves and the amber itself that geologists have found in the blue earth (shale) along the Baltic coast of Samland. However, meager as these fossil remains may be, it is possible for us by "analogy and inference", to get a fair picture of the Oligocene forests and the conditions in which P. succinifer grew. Inference tells us that the trees were not large in size; medium would probably be more accurate in that respect. They grew in scattered clumps and as solitary individuals, and were not too choosy as to their habitat, some growing in sandy dune localities, while others ventured into places where swampy conditions prevailed. All these conditions we find duplicated in the gum-bearing pines of our present time. Among the some eight hundred species of pine now known to be growing on the earth's surface, we find that certain species are prolific gum-bearers, as for instance, the New Jersey pine that is partial to the sandy barrens along our northeastern coast from Maine to Georgia, where they appear in several species, some of which grow in swampy conditions as well as on the sandy barrens.

It seems reasonable for us to infer that these sticky gum-bearing species of pines were not too far removed from relationship with Pinus succinifer. However, our present trees do not produce any amber, the gummy sap drying into resin that is not nearly as hard as true amber. The true amber, as it oozed from the tree, was very clear and loaded with an aromatic oil that in time largely evaporated, leaving the gum in a hard resistant state.

The comparison of numerous analyses of amber causes us to conclude that the substance is not homogeneous; the amount of succinic acid present is noted from the amber gathered from different localities, which may be accounted for by varying conditions of habitat. Its color is generally golden yellow, but may vary from that to dark brown. Also, all gradations of transparency may be found, from clear transparent to opaque, cloudy white, etc. Its hardness ranges from 2-3, which is sufficient for it to be worked with ease and to take a good polish. The specific gravity of amber is scarcely greater than that of water, and it will float in salt brine, a fact that accounts for its appearance at sea beaches after storms. Salt brine may be used as a convenient test for the genuineness of the substance: synthetics will usually sink. Amber occurs in the form of nodules, mostly of irregular shapes, and varying in size from that of small shot, to masses weighing several pounds. The largest mass of which we have record weighed 21 pounds and was preserved in the Berlin Museum. We wonder where it is now?

Besides the above enumerated physical characteristics, chemists have found some others equally striking. It has been found that when amber is heated to 150 C. it becomes so soft and pliable that it may be moulded, and this makes it possible to profitably use much fine material that otherwise would be lost. Again, when heated further to 250-300 C. it melts, yielding amber oil, and a black residue called amber pitch, which when dissolved in turpentine, forms amberlac. Also, by dry distillation succinic acid is obtained.

Of all these several derivatives the oil of amber is the most important. According to Kunz, "The oil was first made and sold by a shyster, one Johann Meckenbach, who claimed to have discovered the process of obtaining it from amber in 1548. However, the process had been previously worked out by another, who received no credit or emolument for his discovery." Dr. Meckenbach was shrewd, avaricious, and unscrupulous, and as Kunz writes, "Gained great repute by this means, and when he communicated to Duke Albrecht of Prussia the secret of his process, the rulers of other lands overwhelmed the Duke with requests for a supply of the precious remedy, which was believed to be a sort of panacea for many diseases". Indeed, this oil of amber, the Oleum succini of the Pharmacopoeia, has even to this day maintained its reputation as a cure for various diseases, such as the relieving of inflammation and pain of the joints, asthma, bronchitis and infant convulsions.

At this point it seems fitting for us to permit Hugh Miller, the Scottish geologist, to write the following comments for us. He was the first man ever to write on geological subjects in terms that could be understood by all readers. "To the geologist this precious gum of the Tertiary age is fraught with peculiar interest, from the circumstance that it forms the best of all matrices for the preservation of organisms of the more fragile kinds. Mosses, fungi, and liverworts, are plants of so delicate structure, that they are rarely or never preserved in shale or stone; but specimens of all these have been found locked up in amber in a state of most-perfect keeping. And besides containing fragments of the pine which produced it, it has been found to contain minute pieces of four other species of pine, with bits of cypresses, yews, poplars, junipers, oaks, beeches, etc., in all forty-eight different species of shrubs and trees, which must have flourished in the forests where it grew.

"The most remarkable organisms of the amber age are, however, its insects. Fossil insects occur in both the Secondary and Paleozoic divisions, but rarely indeed in a state of sufficient entireness to enable the entomologist to distinguish their species. In amber, on the contrary, even the most delicate ephemeridae that ever sported for a single summer evening in a forest glade, and then perished as the night came on, are preserved in a state of entirement. In the amber of Prussia eight hundred different species of insects have been determined, most of them belonging to species, and even genera, that appear to be distinct from any now known; while some of the others are nearly related to indigenous species, and some seem identical with existing forms that inhabit the warmer climates of the south. From their great specific variety and abundance we may infer that insects then, as now, formed the most numerous division of the animal kingdom."

You will scarcely consider the riddle regarding the entombment of these fragile creatures in the amber a particularly hard one; the process must have resembled that which we see going on in our pine forests every summer. The little flitterers, beguiled by the grateful perfume, must have settled on the bleeding trunks of Pinus succinifer and stuck fast, and the after-flow of the sap covered them over. Nothing mysterious in that process.

Pliny the Elder in his Natural History, devoted considerable space to the discussion of amber. Most of what he wrote is as correct today as it was when written in the first century A.D. He relates that it comes from the coasts of the northern ocean, where Germania borders the sea. Concerning the manner of obtaining the amber, he writes, "Each spring when the storms are raging, amber is thrown upon the shore. The Goths who live there collect it and barter it to the Teutons, who trade it to the Roman merchants." This last packed statement has far-reaching historical implications that space will not permit our enlarging upon.

The particular part of the Baltic coast where the amber-bearing "blue earth" is sufficiently close to the shore to be cut into by the waves, is situated along the eastern shore of the Gulf of Danzig, between Pillau and Memel. Near Palmnicken, the beds extend inland for a short distance, where the world's only amber mine once processed the blue earth for the precious gum by sluicing after the manner of hydraulic mining for gold. From the days of Duke Albrecht and his corner on amber oil to the days of Hitler's imbroglio, the mining of amber was monopolized by the Prussian government. Anyone finding amber was required to sell it to the State. This calls to mind the present De Beers Diamond Syndicate of South Africa, so far as its influence upon the diamond market is concerned.

A few other places contribute to the world's supply of amber, but in much lesser quantities, and very much lower in grade. Probably none of it is true amber, as defined by Dana. Red amber occurs in the Miocene beds of Sicily, and along the coast of the Adriatic Sea. Some amber has been recovered along the shores of Greenland, Siberia, China, England and Scotland. In the United States a limited amount of amber has been found mostly in the Greensands of New Jersey. From a historical standpoint a deposit of amber in the Dominican Republic is worthy of mention. It was discovered by the Spaniards and reported by Columbus in his report of his second voyage of discovery.

References:—

Berry, E. W., "The Baltic Amber Deposits", Sci. Mo., XXIV, 1927, 268.

Farrington, O. C., "Amber", Field Mus. Pub., Geol. Leaflet 3, 1923.

Kunz G. F., "Magic of Jewels", Lippincott, 1915.

Ley, Willey, "The Story of Amber", Nat. Hist. XLI, 1938, 351.

Miller, Hugh, "Popular Lectures on Geology", Hurst, N.Y.

Schmidt, G., "Visit to Prussia's Amber Mine", Rocks & Minerals, XII, 1937, No. 6.

Weinstein, M., "Precious & Semi-Precious Stones", London, 1929.

(*Continued from page* 209)

Small specimens should be sent intact. A sample not smaller than the first joint of a man's thumb should be detached from a larger specimen at some place where such detachment will do the least damage to the specimen.

Should tests prove a specimen to be meteoritic, an offer of purchase will be made. Further studies will then determine to which classification the meteorite belongs and institutions in need of the particular type of meteorite recovered will be supplied.

NOTES ON LUMINESCENCE

Excerpts from CIBA REVIEW, No. 140, October 1960.
By courtesy of Ciba Limited, Basle, Switzerland

Luminescence in Relation to Organic Compounds

TO the scientist, *luminescence* means the emission of light under "cold" conditions, in contrast to *incandescence*, examples of the latter being the sun or a filament lamp, where the light is entirely due to the great heat energy of the source. Luminescence requires the excitation of molecules to emit light by activation from some nonthermal form of energy, such as a stream of electrons, ultra-violet light, or a suitable chemical reaction. We meet these three examples in the television tube, where inorganic luminophors are excited by an electron beam, in the fluorescent mercury lamp, where ultraviolet light is transformed into red fluoresence to supply the lack of that colour in the light emission of mercury vapour itself, and in the glow-worm, where biological oxidation processes generate its mysterious signal. In this account we shall refer only to fluorescence and phosphorescence excited by light, and to chemi-luminescence.

Fluorescence

Fluorescence was the last of these effects to be differentiated from other appearances of light because it needed proper experimentation to bring out its characteristics. Early workers, such as Robert Boyle (c. 1650), had noticed the blue colour of certain yellow plant extracts when viewed away from the source of illumination. Boyle wrote of one solution: "If you hold this phial from the light, so that your eyes be placed betwixt the window and the phial, the liquor will appear of a deep and lovely ceruleous colour. This and other phaenomena, which I have observed in this delightful experiment, divers of my friends have looked upon not without wonder." It was not until just over a hundred years ago that Sir George Stokes was able to distinguish the effect on a scientific basis. Many colour manifestations are observed when objects are illuminated with white light, such as in opals, the rainbow, sunsets, or the blue of the sky, all of which can be interpreted in terms of the consequences of the wave-theory of light; that is, by dispersion and scattering of the different wavelengths of white light. Stokes showed that, in fluorescence, light of one wavelength was absorbed by the substance and, instead of this absorbed light being converted to heat energy, as in the majority of substances which owe their colour to light absorption, it was re-emitted again in all directions at a longer wavelength. Such a wavelength change cannot be explained by the wave-theory of light, but we can easily understand it in terms of the quantum theory. Light is now known to be absorbed or emitted in energy quanta of a magnitude given by the equation (energy) $\times$ (wavelength) $=$ constant. Stokes' conclusions now appear as the absorption of light quanta of a certain size by the molecules of the substance; the loss of a small part of the energy of each of these quanta as heat; followed by the re-emission of light of somewhat longer wavelength appropriate to the curtailed energies. In non-fluorescent substances light quanta which are absorbed by the molecules are entirely "degraded" to heat energy, that is, by energy dissipation they are irreversibly split up into many small quanta spread over all the molecules present. In fluorescent substances, molecules which become "excited" by absorbing quanta of light have the power to hang on to the greater part of the energy they have received long enough to be able to radiate new quanta nearly as large as the original ones. Two matters need consideration for further insight: how long the molecules take to re-radiate, and what factors predispose a molecule to radiate at all. These queries are intimately connected with one another.

To a physicist, the absorption or emission of light are reversible processes, and the behaviour of atoms is simple in this respect. Atoms have definite, sharp, energy levels, and freely absorb or emit light of wavelengths corresponding to these levels. Molecules, however, have complex inner structures, and their levels are broad because of the association of inter-atomic vibrations with electronic changes induced by light absorption. That is why molecular absorption bands cover a range of wavelengths. In a complex molecule there are great possibilities of energy rearrangements, that is, of conversions of energies of electrons (which primarily take up the light quanta) into energies of vibration of the atoms, ultimately merely warming up the material. Theory tells us that any reradiation process does not occur instantaneously, but takes a finite time. Whether a molecule is capable of reradiating after absorbing light entirely depends on which is the faster, the rate of light emission or the rate of energy degradation to heat. It is because we know so little about the latter of these rates that we have to limit ourselves to empirical and generalized rules for predicting fluorescence power. Rates of light emission can be directly measured, and for fluorescent substances are characterized by "mean-lives" of 10^{-8} to 10^{-9} seconds. Short though this period may be on a human time scale, it is long enough for energy rearrangements to occur in most molecules, so that fluorescent power is lost. Theory indicates that short radiational lives favour fluorescence, and that short lives are associated with strong absorption bands, as possessed by dyes.

Phosphorescence

Another effect of molecular luminescence, first clearly interpreted by G. N. Lewis, both complicates and clarifies many aspects of the subject. It is called phosphorescence (though this term has more than one usage) and was first applied to observations on the "Bolognian stone", an impure form of barium sulphide prepared by an alchemically-minded bootmaker, Casciorolo, about 1600, which glowed in the dark after being exposed to sunlight. This "stone" is the ancestor of the many present-day efficient phosphors used in lamps, television and X-ray screens, etc. Lewis worked with organic substances embedded in rigid glassy solvents, where glows lasting several seconds may be observed after strong illumination of the material. The effect differs from fluorescence in two marked ways; the glow does not have a wavelength near a strong absorption band of the substance, but lies much further away towards the red end of the spectrum, and the radiational life-time, instead of being 10^{-8} seconds, is about a hundred million times longer. The interpretation is found in modern concepts of the energy levels of molecules. Normally molecules are in their "ground" levels; by absorption of light quanta some are raised to an "excited" level. Fluorescence occurs when they drop back again with only minor energy loss. We now recognize that molecules have other levels lying between the "ground" and "excited" states which cannot be reached by direct absorption of light quanta, the name for them being "triplet" levels. These levels differ from the short-lived excited levels by the relative orientation of electron spins. Where inner energy re-arrangements occur rapidly within an excited molecule it may become transformed to this "triplet" state. Because of its changed spin character it has a very slow rate of dropping back to the ground state with emission of the phosphorescence, spin changes occurring only with reluctance.

Lewis noted that certain classes of organic compounds, quinones, azo dyes, and some heterocyclic substances, passed from their "excited" states very quickly to their "triplet" states. These substances, therefore, do not fluoresce, but may be induced to show phosphorescence by suitable inhibition of energy degradation processes—use of low temperatures and rigid media.

In some cases a different form of phosphorescence appears. Where the triplet level happens to be rather near the excited level produced by light absorption, if the temperature is not too low, transfers to and fro from one to the other may occur, finally terminating with light emission from the upper level. This light is that of the normal fluorescence, but of greatly enhanced life-time because of the delays in the lower level.

The discovery of triplet levels is one of great significance, not only for the understanding of luminescence effects, but because it showed the existence of these transitory but relatively long-lived chemically reactive intermediates, which play important parts in photo-chemical changes.

Chemi-luminescence

The last form of luminescence to be discussed here is sometimes called phosphorescence, but more correctly should be referred to as chemi-luminescence. It is observed in the glow of white phosphorus in air (called by Boyle the "icy noctiluca") and from glow-worms, fire-flies, shining wood, and many sea-creatures, of which a life-time study has been made by E. Newton Harvey. The effect is always associated with chemical reactions which are usually oxidations. In these reactions molecules of a fluorescent nature are produced, not, as normally occurs, in their "ground" states, but electronically excited, and they lose their energy by radiation just as they would if excited by absorption of light. The colour of many chemi-luminescent processes is green or blue and a "quantum" of such light amounts to 60,000 calories or more per mole. Energy of this magnitude is comparable in value to energies of linking between atoms in a molecule, and therefore we can understand its accumulation only if free radicals are combining to form new linkages. The oxidation processes associated with chemi-luminescence are all chain reactions with radicals undoubtedly present, but much work remains to be done before a clear comprehension of the mechanism of the reactions and of the identities of the molecules involved can be obtained.

Uses of Luminescence

The uses to which substances showing luminescence are put vary from crude detection to the elucidation of complex molecular phenomena. One of the most spectacular of the cruder sort is the tracing of the course of water currents. As early as 1878, large quantities of fluorescein were put into the upper Danube during a dry summer when the river disappears into the limestone, and the dye was found by its fluorescence to have reached the river Aache, which flows into the Rhine, thereby demonstrating an underground connection between the two large river systems. The course of streams in caverns of the Pyrenees and elsewhere has been similarly explored. The dispersal of atomic waste by tidal movements after discharge into the sea has been investigated with sodium 2-naphthylamine 6:8 sulphonate used in ton quantities. Bags of fluorescein trailed in the sea facilitate the discovery by air of aircraft crew who have escaped from a crash by rubber boat in the ocean. Colourless fluorescent powders afford an easy means of identifying suspected petty thieves. Paper has some degree of fluorescence, which is modified if the surface is disturbed, so that forgeries or erasures may be detected. Sometimes manufacturers of such materials as fine glass-ware, proprietary drugs, etc., deliberately incorporate traces of fluorescent ingredients, invisible to the public, to enable them to identify one of their products afterwards. Fluorescent solutions are also

(*Continued on page* 224)

Book Reviews

DESCRIPTIVE PALAEOCLIMATOLOGY. Edited by A. E. M. Nairn. Interscience Publishers. 1961. 380 pp. $11.00.

Climate has played such a large part in the survival and development of the earth's flora and fauna, and even in the deposition and metamorphosis of minerals, that an independent reconstruction of it in past epochs has been needed for some time. In the present formative stage of palaeoclimatology as a science, the volume under review is an excellent beginning for such a reconstruction.

The editor is professor at Kings College, University of Durham, England. Of the fourteen authors contributing to the symposium, Great Britain and the United States comprise over half. Japanese, German, Canadian, and Australian authors also contributed.

The first two chapters are general and outline the scope of palaeoclimatology and the fundamentals of climate. Eight chapters are devoted to the inter-relationship of climate with the formation of desert sandstone, evaporites, red beds, and glaciers, and with the development of vertebrates, invertebrates, botanical forms, and with geophysical phenomena. The remaining chapters stress geographical areas, i.e., the palaeoclimatology of North America, Europe, the Far East, and the hypothetical land mass known as Gondwanaland which once may have comprised all the continents in the southern hemisphere.

Most of the authors suggest tentative conclusions only because of the limited data available and the pitfalls encountered in interpreting them. The most positive position is that taken by Professor King of the University of Natal, Durban, South Africa who accepts the concept of Gondwanaland and of Continental Drift in the Palaezoic era as the only possible explanation for the geological features found in the several southern continents today.

Climatologists have been highly resourceful in recognizing existing evidences of conditions millions of years ago. Tillite, for example, is believed to be the most widespread and reliable evidence of ancient glaciation. The pre-Cambrian era is now thought to have known one or more glacial periods.

The sun is practically the sole source of our heat. About 43% of incoming solar radiation is estimated to reach the earth's surface, 42% reflected into outer space, and 15% absorbed by the atmosphere. The range of mean temperatures in Arctic regions has been about 40° C, in North America 20-30°C. In general the mean temperature of the earth is believed to be declining somewhat. Some climatologists link this to the steady diminution of carbon dioxide in the atmosphere (which enables it to retain heat) as more and more is locked up in limestone and coal deposits.

Temperature, of course, is only part of climate. Professor Opdyke of Rice Institute shows how cross-stratification in desert sand dunes reveals the direction in which Palaeozoic winds were blowing. This cross-stratification is believed to be a remnant of successive foreslopes of ancient sand dunes which advanced with the dominant winds. The degree of aridity is indicated by the earth's deposits of gypsum, anhydrite, halite, dolomite, etc., since each was deposited from water of different salinity and temperature. The observer must be alert to take into account any paragenesis, or interaction between salts, however.

FIELD GEOLOGY. Frederic H. Lahee. McGraw-Hill Book Company. 1961. 926 pp. $10.75.

This book has been well known to geology students for over forty years. The first edition was printed in 1916 when Dr. Lahee was Assistant Professor of Geology at the Massachusetts Institute of Technology. Prior to retirement in 1955, Dr. Lahee was Geological and Research Counsellor to the Sun Oil Company. The present edition of this book is the sixth.

Almost every characteristic found in rocks is described in detail, first for sedimentary, then for igneous. The field relations of each class are outlined. Metamorphic rocks are discussed from the standpoint of origin and degree of metamorphism.

Topography and geologic and geophysical surveying form the subject matter of the last half or more of the book.

Among the newer topics discussed in this edition are contemporaneity in sedimentation, tectonic correlation of sediments, the "granite problem," the use of the Jacob staff, etc.

The author is careful to define unusual terms when using them for the first time. The beginning geologist is introduced to turbidity currents, stone tracks, patterned ground, pluton, lopolith, phacolith, etc. without losing his bearings.

Over sixty new references have been added to the bibliography in the present edition.

THE ABUNDANCE OF THE ELEMENTS. Lawrence H. Aller. Interscience Publishers, Inc. 1961. 283 pp. $10.00.

At the same time scientists are filling gaps in the periodic table of the elements of which matter is composed, other scientists are questioning "How were the elements formed and what are their relative abundances in the universe?"

In "universe" the author, who is associated with the Observatory of the University of Michigan, includes the sun, the solar system, gaseous nebulae in the neighborhood of the sun, and the stars.

The composition of our universe is not static. For example, a gradual transformation of hydrogen into helium and heavier elements is continually taking place. Estimates have been made by Urey and others, however, which indicate that hydrogen, oxygen, neon, carbon, nitrogen, magnesium, and silicon are the most abundant elements.

The most satisfying theory on the origin of the elements postulates stars composed originally of pure hydrogen which burns to produce helium and eventually heavier elements. Only massive stars or supernovae can produce elements high in the periodic table. Some of these heavier elements are locked in the ancient white dwarf stars and are lost to us, but new stars form continually from the remaining elements in the interstellar medium.

The total mass of the earth is estimated as core 31.4%, mantle 68.1%, and crust 0.5%. The core is believed to be largely iron and nickel, the mantle a mixture of subsilicic rocks such as eclogite, dunite, and peridotite. The elements Na, Al, K, Ca, Ti, and the halogens are more abundant toward the earth's surface; Mg, S, Mn, Fe, Co and Ni are found in the deeper layers of the mantle.

Composition of the earth's mantle is believed to be similar to that of chondritic meteorites which Nininger estimates comprise 90% of all meteorites. These are stony in appearance but contain spheroidal bodies or chondrules similar to igneous rocks such as olivine and plagioclase.

This book expands the mineralogist's horizon to a cosmic scale and provides orientation in a universe which is gradually yieding some of its secrets to the men of at least one small planet.

PALEOGEOLOGIC MAPS. A. I. Levorsen. W. H. Freeman and Company. 1960. 174 pp. $6.00.

The author early recognized the value of paleogeologic maps when his students at Stanford University showed marked increase in understanding geologic history after making some of these maps.

A paleogeologic map shows a surface of unconformity in the earth's crust that is partly or wholly buried today. It is constructed both from visual surface and also subsurface observations. From the standpoint of petroleum reserves, paleogeologic maps are of great importance. They enable the geologist to trace the sequence of deformation in the earth's crust, deposition, fluid flow, metamorphism, location of wedge belts of rocks, and other factors contributing to entrapment of petroleum.

Preliminary chapters are concerned with terminology, sources of data, and the preparation and interpretation of maps. A succession of maps is useful in depicting the steps through which major earth faults are formed.

The major portion of the book is a presentation and interpretation of actual maps of oil fields, of regional areas, and of continents. Some foreign areas are included along with extensive United States data.

21st Annual Convention

A Great Gem and Mineral Show at Saginaw

Photographs by courtesy of Fred Rentzel

The 1961 Convention of the Midwest Federation, now a matter of history, has indeed in its own right made history for the "Midwest" well worth noting in the annals of Earth Science.

Held on June 29th through July 2nd, on the grounds of the Saginaw (Michigan) County Fair Association, said to be the second largest in the entire country, under the sponsorship of the Tri-County Rocks and Minerals Society, five large buildings were completely occupied by personal and club exhibits and dealers booths, displaying material of such high quality and character as has been seldom equalled in Regional Shows anywhere.

Too much credit for this splendid success cannot be given Harry H. Sprague, General Chairman, who had devoted much of his spare time for more than a year supervising all plans being made for the Convention and Show. Whenever difficulties or conflicts arose, as is often the case in such a time, they were soon tactfully ironed out under his skillful managerial ability to the complete satisfaction of all concerned.

The great Gem and Mineral Show could not possibly have been such a success were it not for the splendid cooperation of many neighboring Clubs and individuals. The Flint Rock Gem and Mineral Club, the Michigan Mineralogical Society, the Central Lapidary and Mineral Society, and the Grand Rapids Mineral Society were all especially helpful, as well as many individuals including Floyd Mortenson, Midwest Federation President, Don Sommerfield, Tri-County President, Messrs. Marion Gingery, Glenn Boissonneault, Gerald Pilar, and Mrs. June Culp Zeitner.

Perhaps the most striking exhibit of the entire show was the so-called "Hall of Giants." The specimens on display through the center of this special exhibits building were all outstanding pieces that would uphold the reputation of the nation's finest museums. They were for the most part all owned by private collectors. It is quite possible that never again will such a collection of "Giants" be assembled in the midwest. Among the outstanding specimens exhibited were the

Retiring President Floyd Mortenson passing Gus Brown memorial gavel to incoming President Leo Yanasak.

following listed, and many other fine ones too numerous to mention.

JADE PEBBLE: 1400 lbs. worn smooth by the waters of the Fraser River in British Columbia, a true giant of gems.

BLADED CALCITE: 135 lbs. This specimen is reputed to be the second largest of its kind to be taken intact from the mines of Mexico.

CYCAD HEAD: 104 lbs. Once the blossom of an ancient plant, now petrified. Though not the largest ever found, this South Dakota Giant could hold its own in any museum.

PETRIFIED WOOD: 3 ft. dia. Polished tree section. A prize specimen of the ancient forests of the past.

TABULAR CALCITE: Three of the largest specimens in existence. These pieces are true giants of the mineral world. Less than 100 have come out of Mexico so far. To own even a small specimen is a rarity.

In the Special Exhibits Hall were many other outstanding cases, some of the finest we have ever seen, two from California which had never before been on display east of the Rocky Mountains. These were

GOLD DISPLAY:
Mr. Ross Cook, California
20 lineal feet of crystallized gold from all over the world

SILVER-ONYX DISPLAY:
Mr. Cliff Zarley, California
A distinctive display of very beautiful material

CORAL GEODE: 200 lbs. plus. The world's record Coral Geode! Largest single Geode of Chalcedony Pseudomorph After Coral on record, being a part of a 20 foot lineal glass case display of the same material, the finest of its kind ever gathered together in one place.

All through the other buildings, were many equally fine exhibits, privately owned collections of every conceivable type of lapidary art, such as faceted gem stones, carved semi-precious gemstone material, slabs, cabochons, tumbled pieces, and assembled gemstone jewelry, micromounts, mosaics and just plain mineral collections of such excellence that had to be seen to be fully appreciated. To describe them we would hardly know where to begin.

HALL OF GIANTS. 1400 pound Jade Pebble in the foreground, worn smooth by the waters of the Fraser River in British Columbia. A true giant of gems.

The usual convention programs of speakers, demonstrations, symposiums, swapping and silent auctions were all successfully carried out and were well attended. Such outstanding guest speakers as Mrs. Doris Kemp, Mrs. June Culp Zeitner, Mr. Tolson Radloff, Dr. Andrew J. Mozola and others were on hand to impart their store of knowledge and valuable observations to those who were eager to hear and to learn. Personally, the writer considers these lecture meetings to be one of the most important features of any convention, and much too often they are not fully appreciated or attended by the rank and file of the visitors,—too busy just looking.

And finally, the social end of the Convention was not neglected, as was evidenced by the full house at the Bulletin Editors' Breakfast held at the High Life Inn on Saturday morning. Here judges' decisions were announced and awards given for the best submitted in the Bulletin judging contest. Guest speaker Mr. Russell MacFall, on the editorial staff of the Chicago Tribune, who was introduced by Toastmaster Russell Kemp, spoke on the proper function of the Mineral Club Bulletin, emphasizing some do's and don'ts which might be helpful to the editors.

At the closing banquet, Saturday evening, some 375 guests were seated,—many others being turned away for lack of room. This was a very festive occasion, and many prominent guests including Mr. Henry Graves, President of the American Federation, were introduced and responded to toasts. Numerous individual awards were given for services rendered including a special award to Dr. Ben Hur Wilson, first President of both the American and the Midwest Federation, in recognition of his untiring efforts on behalf of all Rockhound interests throughout more than 30 years of service. A final climax of the entire convention was the witty, sparkling and very worthwhile oration by the inimitable June Culp Zeitner, entitled "The Foot of the Rainbow," a fitting close to three days of joyous living.

Well attended field trips were also carried out as scheduled to the U.S. Gypsum quarry at Alabaster, Michigan, and to the Saginaw Malleable Iron foundry in Saginaw on Saturday, and to the Wallace Stone Company quarry, east of Bay Port, where calcite and a large variety of fossils might be collected, on Sunday. Here Mr. Robert Gannon, of the Michigan Mineral Society, served as guide.

Field trips are always popular, and the Saginaw trips were no exception to this rule. They were well patronized as shown by the large number of cars present shown here.

(*Continued from page* 207)

We all like to think we are original. In literature I have read I have not seen a method such as this described, nor have I seen any jewelry on display at any show using a wire lace technique. Therefore, I would like to think that I am the originator of this method. All the designs of my jewelry are original. We can all be original and create some lovely ideas and pieces of jewelry. All we need is the urge to start to work, some materials, and then the ideas just seem to come into our minds. You may wish to use my ideas or create your own. Either way, good luck and many happy hours in your work shops.

(*Continued from page* 216)

used to mark laundry or new-born babies in hospitals with signs invisible in daylight. Minerals, particularly those containing uranyl compounds, may be sometimes recognized by illumination with ultra-violet light, but as a general manner of identification it is vitiated by the dependence of the fluorescence on traces of impurities. In palaeontology, the method is more successful; in particular, fossil bones and teeth fluoresce quite strongly, and details of anatomical structure not visible in daylight illumination may be brought out. Hair-cracks in metals or ceramics may be detected by forcing fluorescent liquids through and examining the surface in ultra-violet light. Striking theatrical effects are obtained by the use of costumes treated with fluorescent materials. For the above purposes the illuminant is always a mercury lamp with one or other of two types of "black-glass" filter or screen which are available; either "Wood's glass", transmitting the mercury line at 3660 A, or a second type transmitting all the ultra-violet region from 4000 to 2500 A. The filters eliminate visible light, which would interfere with the detection of fluorescence, but it should not be forgotten that they transmit a little red light, which could be mistaken for long-wave fluorescence.

(*Continued from page* 210)

His collection of trilobites soon became famous, and he was considered to be a reliable authority upon the subject. His published articles, for their thoroughness and readability, have seldom been equaled by either professional or lay students. All who may in any way be interested in this most fascinating branch of paleontology (Trilobita), should refer to his series of articles published in early issues of Earth Science magazine.

May we refer you especially to the following articles: (1) The Trilobita, July 1952; (2) The Cambrian, March 1954; (3) The Ordovician, May 1954; and, The Silurian, November 1954. And, by all means if you are ever in the vicinity of Milwaukee, do not miss the opportunity to visit the Milwaukee Public Museum and see the many superb collections in their cabinets, including the Montague collection. Advice: Don't let the Trilo**bita** bug bite you.

All are grateful to Mrs. Montague for making this fine contribution to the welfare of our hobby.

Messengers from Heaven

This is what meteorites have often been called, and such a messenger we are told was recently received by Troy Peterson, of Marshall, Texas, on the evening of July 11th. While standing on his porch watching a swarm of fiery meteors, "shooting stars", streaking across the sky, a small meteorite coming as a red ball of fire from the west, fell within ten feet of him, burying itself four inches in the ground. The object weighed 16 pounds.

Midwest Club News

Mrs. Bernice Rexin, Club Editor
3934 N. Sherman Blvd.
Milwaukee 16, Wis.

WABASH VALLEY GEM & MINERAL SOCIETY recently enjoyed an illustrated lecture on "Volcanoes of Hawaii," by Mrs. Newton Gottschill.

On June 18 the society planned to hold a joint picnic and field trip, together with the Elkhart Mineral Society and the Peru Rocks and Minerals Society, to Pipe Creek Falls, 10 miles southeast of Logansport, Ind. The falls here are caused by a fossil reef and in the gorge formed by the waterfall recession are found fossils of the middle Devonian age, including solitary corals, colonial corals, stromatoporoids (13 varieties), bryozoa, some crinoid stems, and occasionally the basal portion of a crinoid head.

BLACKHAWK GEM AND MINERAL SOCIETY at its June meeting heard Jack Musgrove, Curator of the Iowa Historical Department, speak on "Rocks of Iowa." Members brought rocks that they had found in Iowa to the meeting and Mr. Musgrove properly identified them for those who were not sure what they had collected.

BLUE RIDGE GEM AND MINERAL SOCIETY of the greater Kansas City area has changed its membership policy. Previously the society limited its membership because meetings were held in the homes of members. It has now obtained meeting quarters in the basement of St. Matthews Episcopal Church in Rayton, Mo., so, beginning with the September meeting, the group will welcome visitors and new members. It meets the first Friday evening of each month. For further information contact Mrs. Ethel Olson, Secretary, 6329 Cedar, Raytown, Missouri.

MEMPHIS ARCHEOLOGICAL AND GEOLOGICAL SOCIETY has purchased 100 color slides of minerals for program material and study purposes.

Each month a new lecture on the prehistory of the Mississippi Valley is presented to the society by member Dan Printup. The lectures are also printed in the society's newsletter and are well worth reading. Its July newsletter featured Mr. Printup's talk on "The Archaic Culture."

GRAND RAPIDS MINERAL SOCIETY on July 15 featured a dealer's night at Camp O'Malley. Dealers belonging to the society brought samples of their wares to the meeting for display and sale purposes.

LAKE ERIE GEM AND GEOLOGICAL SOCIETY reports that a long list of its members have signed up for the Elyria High School's adult lapidary class, which will go into session one night a week for eight weeks during October and November. The school has purchased two 10-inch trim saws and three combination grinding and polishing units for the course. This equipment has been installed in the art class room and the school is contemplating making lapidary a part of its present art classes.

MESABI ROCK AND MINERAL CLUB viewed an educational film on "The Three Types of Rocks" at its June meeting. Everyone present received a free streak plate.

SHAWNEE-MISSION GEM AND MINERAL SOCIETY planned to visit a farm near Lincoln, Mo. on Aug. 12 to look for Mozarkite. On the Labor Day weekend the group plans to hunt for quartz crystals at Mt. Ida, Arkansas.

DES PLAINES VALLEY GEOLOGICAL SOCIETY made a late spring trip to Wisconsin's Marathon County, to search for Labradorite. This mineral is distributed throughout an outcropping of crumbly feldspar west of Wausau. Most specimens are found on the surface, where weathering has cleaned the rock, making the tell-tale blue sheen readily apparent.

Labradorite, a feldspar, is a sodium and calcium aluminum silicate and occurs as a part of the plagioclase series. Its name identifies the source of the best specimens. Plagioclase, which means oblique cleavage, refers to the shape of the cubic or blocky pieces obtained when the mineral is broken. True Labradorite is clear to translucent and possesses adularescence, the ability to reflect blue light waves only when the surface of the mineral is tilted at the right angle to the light source.

The Wausau mineral has a localized bluish sheen, but the Labradorite does not extend throughout most of the specimens, but grades into a darker, less reflective material.

CENTRAL MICHIGAN LAPIDARY AND MINERAL SOCIETY on June 25 visited the Cheney Limestone Company pit at Bellevue, Mich., to collect fossils, calcite, marcasite, and pyrite. Its members were warned in advance to stay away from the area where holes had been drilled for blasting and not to pull any of the wires from the drill holes. This is good advice for anyone visiting a quarry.

On Sept. 16 and 17 the society will make a field trip to Silica, Ohio for trilobites and brachiopods.

MID-IOWA ROCK CLUB AND THE SAC AND FOX LAPIDARY CLUB were hosts to a very successful rock-swap and co-operative dinner on July 30 at Oskaloosa, Iowa. Rock hobbyists at the event came from Oskaloosa, Ottumwa, Marshalltown, Burlington, LeGrand, Waterloo and Dubuque, Iowa, Kansas City, Missouri, and Riverdale, Illinois. Rock-swapping and visiting were spirited and two field trips were also held, one for calcite and one for fossils.

EARTH SCIENCE CLUB OF NORTHERN ILLINOIS on June 9 heard Dr. Eugene Richardson, Curator of Invertebrate Paleontology at the Chicago Natural History Museum, give an informative lecture on "Trilobites." Dr. Richardson used a collapsible paper model to illustrate various parts of a trilobite. He showed how it was possible for it to grow out of its old skeleton, and described its habits and means of locomotion. At one time trilobites were the rulers of the sea, but gradually disappeared some time in the middle Permian, about 200,000,000 years ago.

LINCOLN GEM AND MINERAL CLUB on a recent visit to Freemont, Nebraska's sandpits, collected some choice Lake Superior agates, a Fairburn agate, some beautiful petrified wood and specimens of jasper.

KANSAS CITY LAPIDARY CLUB has accomplished more during its first six months than many clubs who have been organized for years. It has grown to 80 members; made field trips in Missouri, Kansas, Oklahoma, Iowa and Illinois; held an auction which netted it $150.00; put on a display in the Kansas City Library; incorporated in the state of Missouri; joined the Midwest Federation; is publishing an excellent bulletin; and is now putting the finishing touches on its own workshop.

MID-WEST MINERALOGICAL AND LAPIDARY SOCIETY recently viewed an excellent colored film, "The Fossil Story." Mrs. Cecelia Dulak supplemented the film with a display of the major fossil types.

ELKHART MINERAL SOCIETY was visited this summer by Dee Rarick of the Indiana Geological Survey. Mr. Rarick was interested in seeing the mineral specimens of the clubs members. As part of the Indiana Geological Survey's display at the Indiana State Fair, the Survey planned to exhibit one outstanding mineral specimen from each mineral club in Indiana.

CENTRAL IOWA MINERAL SOCIETY, Des Moines, Iowa met Friday, September 8, in the Administration Lounge of Drake University. The program consisted of reports from members who attended the Midwest Federation meeting and color slides of the convention shown by members and guests.

ST. LOUIS GEM AND MINERAL SOCIETY visited areas near St. Charles, Elsberry, and the Clarksville Dam on a recent all day fossil hunt. Trilobite tails and crinoid stems were found in abundance. An Isotelus trilobite head the size of a man's hand was found in a quarry near Elsberry and five miles west of the same town the party collected the little blind trilobites, ampyrina bellatula. Near the Clarksville dam, the mineral collectors in the group were thrilled to discover a hillside full of small gullies in which selenite "Christmas trees" were weathering out.

SILOAM SPRINGS EARTH SCIENCE CLUB is considering building a wall case and filling it with fossil and mineral speciments for the Brown County Community High School where it holds its monthly meetings.

AUSTIN GEM AND MINERAL SOCIETY awards several door prizes at each meeting. Members who are not wearing their name badges are ineligible for a prize.

EVANSVILLE LAPIDARY SOCIETY recently collected petoskey stones and brachiopods from the gravel pits of the White River Sand and Gravel Company.

Other Societies

HEART OF AMERICA GEOLOGICAL CLUB recently enjoyed a demonstration lecture on "Crystal Structure," by Dr. Kenneth Rose. Models of the atomic structure of crystals were shown; the effects of bending, heating, and slow and rapid cooling on the crystal structure of different metals were demonstrated. A Ray-O-Scope was used to show the growth of several different types of crystals.

CONNECTICUT VALLEY MINERAL CLUB's June field trip was to the William Wise Fluorite Mine, Westmoreland, New Hampshire. Some very fine fluorite crystals have been recovered from the dumps of this mine, but the best specimens have been acquired by digging. The color of this material is sea-green, dark green, colorless and rarely purple.

Meteorite Pierces a Home

On Wednesday, July 26th, a small object, believed to be a meteorite, shot through the breezeway of the Ronald Scott home, in Bloomington, Illinois, and passing on through a 1 inch board came to rest on the ground outside the building.

It weighed about a pound, being approximately 3 inches in diameter. When examined by local scientists it was found to contain iron, copper and titanium, all possible ingredients of meteorites, and should this report prove correct it will be one of the very rare occasions when a building of any kind has been hit by one of these strangers from outer space. Such an event has previously occurred in Illinois, when a meteorite fell through a garage and an automobile inside it at Benld, Illinois in 1939. The Benld meteorite may now be seen in the Meteorite Hall of the Chicago Natural History Museum.

Bulletin Editors: Attention!

Bulletin Editors, please note: A number of Club Bulletins are now being mailed to our Chicago Post Office address, and we find that it would greatly facilitate the duties of our Club Editor, if they were to be sent directly to her home address as listed in the heading above the Club Notes.

Further Note: Earth Science takes pleasure in listing all Rock Shows, Conventions and Field Trips that may be of service to our readers, and suggest that any such notices best be sent to our Associate Editor, Mrs. Bernice Rexin, 3934 N. Sherman Blvd., Milwaukee 16, Wisconsin. Ordinarily we shall confine these listings to the two issues immediately preceding the date of the event listed. B.H.W.

RECOMMENDED READINGS

"Tektites' Origin Tied to Meteorites," June issue of *Chip & Lick*, by Robert C. Cowen. Experts generally believe that tektites are produced by the crash of large meteorites. Whether the crashes occurred on the earth or the moon is another question and one which is still hotly debated. Mr. Cowen sets forth opinions of different experts, covering both sides of the question.

"Kaleidoscopic Rocks," by Richard L. Threet, June issue of *M.G.A. Bulletin*. Without mirrors and with nothing more than a transparent chip of rock and two disks of polaroid, your slide projector can become a kaleidoscope that rivals the best. This is a good how-to-do-it article.

AMERICAN FEDERATION OFFICERS

New 1961-62 officers of the American Federation of Mineralogical Societies elected at the annual meeting at Miami, Florida are as follows:
President—Russell H. Trapnell, P.O. Box 10363, Phoenix 16, Arizona.
Vice President—H. R. Hughes, P.O. Box 1163, McAllen, Texas.
Secretary—Albert J. Keen, 2715 N.E. 41st St., Portland 13, Oregon.
Treasurer—Wm. H. de Neui, 6600 Cornelia Drive, Minneapolis 24, Minnesota.
Regional Vice President—Elsie Kane White, 3418 Flannery Lane, Baltimore, Maryland.
Regional Vice President—Johnnie Short, 1978 Mesa St., San Bernardino, California.

The 1962 Convention and Gem Show of the Midwest and American Federations will be held in the State Armory Building and Auditorium in Des Moines, Iowa, the Des Moines Lapidary Society serving as hosts. Many committees are already working on plans for this event which promises to be one of the biggest and best shows of all times. Start planning now for DES MOINES in '62.

MIDWEST INDIVIDUAL CLUB SHOWS

September 23, 24. Rib Mountain Gem and Mineral Society, of Wausau, Wisconsin will hold their 4th Annual Show, in the Youth Building at Marathon Park. Contact Ron Hoffman, 933 South 5th Avenue, Wausau. This is a non-competitive show, but display exhibits are invited.

Oct. 7, 8. The Lincoln Gem & Mineral Club, Inc. of Lincoln, Nebr., will hold a Gem Show at the National Guard Armory, 1776 N. 10th St., Lincoln, Nebr. For complete information contact: Mrs. Maurice Tracy, Sec., Lincoln Gem & Mineral Club, 3601 South St., Lincoln, Nebr.

October 21, 22. The Topeka Gem and Mineral Society of Topeka, Kansas will sponsor a show in Topeka. For further information contact Club Secretary.

Nov. 4, 5, 6. Independence, Mo. Rocks and Minerals Society. Rock show 23rd and Crysler. Guided field trip Nov. 6th.

'61 MIDWEST ROCKRAMA

THE **Indiana Geology and Gem Society** will be host to a Midwest Federation "Rockrama," to be held in the Agricultural Building at the **Indiana State Fairgrounds, Indianapolis, Indiana, October 6, 7, and 8, 1961.** Hours on the 6th and 7th will be from 10 a.m. to 10 p.m., and from 12 noon to 9 p.m. on the 8th. Dealer space is available by contacting show chairman Charles O. Mull, 915 E. 49th street or club president, B. E. Earnest, 6120 Eastridge Drive, Indianapolis, Indiana.

Note: It is announced that the first Midwest Directors' Meeting for 1961-62 will be held at this Rockrama. Watch the mails for further details.

Illinois Geological Survey

Earth Science Field Trips
Fall 1961

September 23, 1961
GEORGETOWN, Vermilion County

Two important Illinois coal beds, the Danville (No. 7) and the Herrin (No. 6), are located in the Georgetown area. The coals and associated strata crop out along streams and are accessible in active and inactive mines.

A visit will be made to an active quarry in the Fairmount Limestone, the youngest Pennsylvanian stratum in the region. At this quarry, the top of the fossiliferous limestone has been polished and striated by glacial action. A succession of glacial moraines and till deposits in the area records an interesting episode of the glacial age.

Assemble at Georgetown High School. 9:00 a.m.

October 14, 1961
VALMEYER, Monroe County

Valmeyer, nestled at the base of the high Mississippi River bluffs at the west side of Monroe County, is an ideal field trip area. Outcrops of Ordovician, Mississippian, and Pennsylvanian bedrock, floodplain features, well developed Karst topography, and deposits dating from the Illinoian and Wisconsinian glaciers are well exposed.

The Valmeyer and Dupo Anticlines, upfolds of the rock strata, intersect the Mississippi bluffs in the area. The region is a leading limestone producer. Numerous quarries offer opportunity to study the rock succession and to collect fossils.

Assemble at Valmeyer High School. 9:00 a.m.

IDAHO
Gem Materials
May we remind you?

The smartest way to get the best for your money is to buy slabs. We learned by experience, and you'll agree, when you see what a dollar deposit will bring to your door in an approval of gem slabs.

IDAHO and OREGON AGATES, JASPERS plus MEXICAN MATERIALS and on request we'll include WYOMING, APPLE GREEN JADE, BLACK JADE, VARISCITE TIGER-EYE, GOLDSTONE, SHATTAKITE, WOODS, etc.—You name it.

HI-POLISH BAROQUES OF
Agates, Jaspers & woods .... $3.00 lb.

IDAHO GARNETS

Rough xls, tumbled stars, baroques, specimens and cut stones. Faceted and stars.

STEWART'S GEM SHOP

2620 IDAHO STREET BOISE, IDAHO

MARIPOSITE

From the MOTHER LODE country of California we are now shipping top quality MARIPOSITE from a new vein. Second grade material will be crushed for terrazzo therefore only select material will be shipped. This MARIPOSITE is beautiful green and white with flecks of pyrite and silver. Beautiful cabs, spheres, bases and columns may be cut and polished or turned on the new rock lathe. A complete table lamp is now on display turned from this material and it is beautiful.

Slabbing chunks .... $1.50 per pound
3/16" slabs .... 50c per sq. in.

Minimum order $5.00

Include postage for your zone

Generous specimen pieces postpaid, $1.50

Please Drop in When Visiting San Francisco Area

GILBERT'S LAPIDARY

1801 E. 14th St. San Leandro, California

Revolutionary Design
PATENTED

DELUXE MIDGET SLIK TUMBLER

Exclusive drive developed, tested and manufactured by us . . . fan cooled motor, essential for continuous operation of a tumbler . . . open, seamless, molded barrel . . . 2 speeds . . . 7 lb. capacity . . . frame all steel construction produces high quality finished material. Easily displayed at gem shows, very quiet operation. LARGER SIZES AVAILABLE.

No. 3, NEW MODEL

Baroque & Cabochons finished in a Slik tumbler

$39.50 includes motor

Subject to change without notice
FOB factory, P.P. wt. 19 lbs.
Add ins. Calif. res. include sales tax
DEALERS SOLICITED
Literature on Request
Tumbling instructions with our tumblers

S. E. LANDON CO. **P.O. BOX 4265, JOSHUA TREE, CALIFORNIA**

CLASSIFIED ADVERTISING

Rate: Eight Cents per word, per issue. Minimum $2.00, payable in advance. No proofs or copies for checking are furnished. Introductory words will appear in CAPITALS. When additional capitalization is required, each such word counts as two words. No charge for name and address.

HARVEY R. SHULL, OSKALOOSA, Ia. Rocks and Minerals of great variety. Huge stock of brilliant fluorescing minerals, including large size Geodes from New Mexico; also several species of brilliant fluorescing natural wood, shaped into animals and other designs, all expertly finished. Sparkling quartz crystals, singles, twins, and clusters, some weighing over 100 pounds each. Large chunks of variegated agate and onyx for spheres, book-ends, etc. Cabinet specimens, cutting agates, and hundreds of other items. Come make your own selections. Safe off-street parking. HARVEY R. SHULL, N. Market Street, U.S. Highway 63, 1 mile North of Post Office. Route 1, Oskaloosa, Iowa.

COLORADO IGNEOUS ROCKS. Complete your Rock and Mineral Collection with eighteen geologists samples, classified, information, chart. All for two dollars postpaid. Satisfaction or refund. EDWARD OLER, 3017 Stuart Street, Denver 12, Colorado.

TEN POUND PACK cutting agates or petrified wood $8.00 postpaid. 100 lbs. mixed tumbling size or (specify) cutting size. $40.00 freight paid. WALT'S ROCKS, Nyssa, Oregon.

KONA DOLOMITE, PETOSKEY STONE, Mary E'len Jasper, Mojave Jasper $1.00/lb. Lake Superior Agate $2.50/lb. Custom slabing, also mineral specimens: rough, slabs, tumbled, jewelry. Dealer, "Rocks" & "Frantom" Lapidary equipment. Phone TW 4-4041, HAZETT STAMP SHOP, 620 N. Grant, Bay City, Michigan.

MINERAL SPECIMENS: Large variety —domestic and foreign. Mineralights, Microscopes, Pocket and Hand Lenses, Books, Geology Hammers, Gift Items. No lists. Specific inquiries gladly answered. Your inquiries invited. GLOBE MINERALS, 163-03 Depot Road, Flushing 58, New York.

SUMMER SPECIAL: Assortment of 20 inches plus of excellent slabbed material, Mexico and Texas agate, etc. $3.00 ppd. Ring eye slabs, $1.10. Free bonus. STAN'S ROCK SHOP, R. 2, on Centerville Rd., Carmi, Ill.

CRYSTALS, MINERALS, semi-precious stones; rough. Pocket size whetstones. Colorful Novaculite for cutting. Also, Rock jewelry. All Rock Hounds welcome. HOUSE OF CRYSTALS ROCK SHOP. R. #1, Box 624, Hot Springs, Ark. (12 mi. S. on Hwy. 7).

Fossils

TRILOBITES (Phacops), $1.00 and up. Fossil collection, 9 different specimens mounted on attractive card, each identified, $1.25. Ten different Brachiopods, $1.50. Gastropod and Pelecypod, 35c each Three different corals, 75c/set. DON H. WHITE, Box 181, Ottawa Lake, Michigan.

HELP!! me improve my fossil stock. I will trade fossils, stamps, and even money (!) for common and rare fossils. Write first, giving fossil identifications, quantity, quality, and state your own needs. MALICKS, 5514 Plymouth Road, Baltimore 14, Maryland.

Equipment

SPECTROSCOPE for quick ore and mineral identification, $3.00. Illustrated cloth instruction book, 220 pages, $4.00. Both, $6.00. Cutt Science Co., 875 Arastradero Rd., Palo Alto, Calif.

ULTRAVIOLET LAMPS, richly housed in aluminum or bakelite; assembled or kits from $10.50. America's most complete line of lamps, kits, filters, tubes, accessories. Free literature. RADIANT ULTRA VIOLET PRODUCTS, Cambria Heights 11, N.Y.

MICROSCOPES: Large Stock. All makes. New, and Used Completely Rebuilt. Send 10c, Stamps or Coin, for listing. Refractive and heavy liquids, Specific Gravity Balances, Scientific Equipment. LAPIDABRADE, INC. 2407 Darby Road, Havertown, Pa.

SALT LAKE CITY, UTAH. Drop in when out this way. We have specialized in Equipment, Findings, Supplies, etc. for Rockhounds since 1950. You may pick up your Free copy of Utah locations, or send a stamped envelope. However, would rather be blessed with a visit. No catalog. KEN STEWART'S GEM SHOP, 136 West South Temple, (½ block west of Temple Square).

December issue ad deadline is October 10th!

Exchange and Miscellaneous

PROSPECTORS! Addresses of Federal, State, and Canadian agencies that offer aid to prospectors and mineral enthusiasts; with resumés showing aids offered by agencies. Examples: free financial aid to prospector, free publications on prospecting and on subjects of general interest to the prospector, agencies that perform free mineral identifications, agencies that offer prospectors' courses for the layman. $1.00 for the list. RICHARD RINKENBERGER, 2161 Sherrelwood Dr., Denver 21, Colorado.

TRY CARVING for fun and profit. Beautiful Colorado Alabaster can be carved with wood tools. We also have Snowy Range Marble in Pink, Red Salmon, and Mottled Gray. $1.00 per lb. We pay postage. DEL-GLO COMPANY, P. O. Box 930, Cheyenne, Wyo.

WANT TO BUY: Mineral collections. Museum quality, domestic and foreign. Small collections and groups of excellent quality acceptable. No shipment prior to correspondence. Write complete details. GLOBE MINERALS, 163-03 Depot Road, Flushing 58, New York.

MUSEUM DIRECTORY, "Mineral, Fossil, Rock Exhibits and where to see them." Lists information on nearly 200 public museums in U.S. and Canada with geological exhibits. Order from AMERICAN GEOLOGICAL INSTITUTE, 2101 Constitution Ave., Washington 25, D.C. $0.50.

FOR SALE: The Edward B. Thomas collection of Rocks, Minerals, Crystals. $5,000. Do not call except by appointment. Visitors welcome. E. B. THOMAS, 4 West Ave., Owego (Tioga County), New York.

LARGEST COLLECTION. Slides of minerals and Geology Club programs with scripts. Send 4¢ stamp for rental list. Catalog of mineral or geology slides (state which), sample and 25¢ credit slip. Postpaid for 65¢. Come and use our equipment in our "Do-it-yourself" lapidary shop. Pay by the hour. ROCK HOUND SPECIAL, 8441E Bolsa Ave., Midway City, Calif.

JADE ARROWHEADS WANTED! State location found, color, and price. Reply to: WM. A. BRADFORD, 96 Washington Street, Quincy 69, Mass.

WANTED: Common rocks, minerals, and fossils in minimum 500 lb. lots. Will purchase or will trade good specimens for bulk. Send samples or advise what you have or can get. TED FREDRICKS —A & T Minerals, Box 189, Port Washington, L.I., N.Y.

Notice to Advertisers

Our advertisers are respectfully advised that the advertising deadline for the next issue will be Oct. 10th for all NEW ADS. Deadline for REPEAT ADS and for NEW PLATES submitted will be Oct. 16th.

ADVERTISERS INDEX

Albanese, John S.	218, 230
American Gems and Minerals	228, 240
American Gem & Mineral Suppliers Assn.	219
Black Light Eastern Corp.	194
Cappotto Rocks and Minerals	237
Conklin, Lawrence H.	230
Corcoran, Fred	237
Craft's Gem Shop	237
Earth Science (Back Issues)	236
Earth Science (Subscriptions)	236
Ebeling's Gem and Art Crafts	224
Gems and Minerals Magazine	219
Geode Industries	238
Gilbert's Lapidary	232
Heartstone Enterprises	225
House of Enterprise	228
Independence Gem and Mineral Show	219
Indiana Lapidary Supplies	233
Jackson, Don L.	237
Jewelgems by Jay O'Day	233
Kyte, Ken	230
Lapidabrade, Inc.	238
Landon, S. E.	232
Laughery, Alice J.	224
McDonald, P. J.	230
Midwest Federation	200
Minerals, Fossils, and Rocks Co.	238
Minerals Unlimited	237
Office Specialties	237
Ottawa Valley Gem Shop	233
Pacific Gemcraft	196
Prospect Lapidary	237
Raytech Equipment Co. (formerly Min'l Equipment)	239
Riley Rock Shop	230
Robert's Rock Shop	225
Rockhound's Trader	231
Rockrama, Indianapolis	231
Rocks and Minerals Magazine	219
Rollin' Rock Club	231
Rubey's Rocks	228
Stewart's Gem Shop	232
S and W Rock Shop	230
Van Nostrand Co., Inc.	220
Vellor Company	230
Victor Agate Shop	218
Vista, Inc.	230
Willems, J. Daniel	218

LABRADORITE

Limited Quantity—Run of Mine

Large Pieces For Book Ends & Spheres

Fine Color and Labradorescence. 100% Usable.

100 lbs.	$ 50.00	500 lbs.	$175.00
1000 lbs.	250.00	1 Ton	$400.00

Wholesale Only. Fed. Tax No. & Check Must Accompany Order.

LAPIDABRADE, INC., 2407 Darby Road, Havertown, Pa.
F.O.B. Havertown, Pa.

Canadian Minerals and Rocks for UNITED STATES COLLECTORS

at wholesale prices

Twelve minerals and rocks of value, in rough, of 6 pounds net, postpaid, for $5.00 only.

ROCKS: Syenite-Nepheline, and Alnoite.

MINERALS: Albite, Orthoclase, Microcline, Brucite, Magnetite, Serpentine, or Chrysolite, Pink Calcite, Apatite, and Phlogopite

COLLECTIONS DISPLAYED IN DE-LUX CARTON BOXES

Collections of 20 specimens, postpaid, for only $1.85 each.
Collections of 10 different outstanding fluorescent minerals, postpaid for only $2.15 each.
Collections of 6 radioactive minerals postpaid for only $2.65 each.

All minerals of these collections are approximately 1" in size and fully labeled. We sell our rocks, minerals and collections prepaid only. Send your check today and you get your package tomorrow.

MINERALS, FOSSILS AND ROCKS COMPANY
Box 1, Hochelaga, Montreal 4, Quebec, Canada

---

2 ALL NEW CATALOGS

CATALOG 58-59

OVER 170 PAGES . . . 46 pages of mountings & findings with new styles never before cataloged. 28 pages covering geodes, minerals, rough gem materials and baroques. 84 pages of machinery, tools, and supplies. 8 x 11 size, completely indexed and bound with a heavy durable cover **$1.00 in stamps or cash postpaid.**

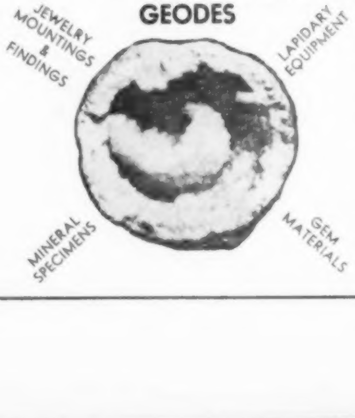
CATALOG 1960

OVER 70 PAGES of the newest styles of mountings and findings in filigree, sterling silver, gold filled, gold and rhodium plate. 33 styles of new filigree mountings. Fully illustrated with hundreds of photos. One of the largest catalogs of its kind ever published. 8 x 11 completely indexed and bound with heavy durable cover. **50c in stamps or coin postpaid.**

BOOKS . . . BOOKS . . . BOOKS . . . BOOKS

Midwest Gem Trails	$2.00
Northwest Gem Trails	$2.00
Colorado Gem Trails	$2.95
Arizona Gem Fields	$2.50
The Agate Book	$2.00
Gem Hunters Guide	$3.95
Field Guide to Rocks & Minerals	$3.95
Lake Superior Agate Book	$2.50
Gemstones of North America	$15.00
Quartz Family Minerals	$3.75
Gemcraft	$7.50
Gem Tumbling	$2.00
Arizona Gem Trails	$2.00
Gem Materials Data Book	$2.00

Treasure Map of the Great Mojave Desert....$1.00



CATALOGS and CIRCULARS

Enclosed please find .... Please rush my copies of the following:

- ☐ CATALOG #58-59. Approx. 175 pages of mountings, findings, equipment, supplies $1.00
- ☐ CATALOG #1960 . . . 75 pages of all new mountings and findings 50c
- ☐ Circular 1633 . . . 33 new styles of filigree mountings .... FREE
- ☐ Circular #2460 . . . DUR-A-LUX mountings and findings .... FREE

Refund Certificate in each catalog or BOTH catalogs free with $5.00 or more order from this ad.

GEODE INDUSTRIES

106 W. MAIN STREET NEW LONDON, IOWA

Situated in S.E. Iowa. The biggest little town in Iowa. Gateway to the land of Geodes.
Registered Trade Mark Applied for
COVINGTON LAPIDARY EQUIPMENT

(See our ad on page 228)